THE

ELECTRICAL REVIEW.

VOL. LXII. MARCH 20, 1908. No. 1,582.

ELECTRICAL REVIEW.

Vol. LXII.] CONTENTS: March 20, 1908. [No. 1,582.

	Page
International Exhibitions	469
Architecture and Illumination	470
A New Bogey	470
Manchester Exhibition	471
Theft from a Factory	471
Bulk Supply in the Greater London Area.—III.	472
Correspondence:—Proposed Engineers' Association; Packing for Export; Car Axle Breakage; Heating Water by Electricity; Carbon Filament Lamps; Generating Station Engineers; Our Home Trade; Automatic Starting Switch; Wireless Telegraphy; Peak Batteries; Non-Professional Engineers; Home Office Inquiry	473 to 478
Legal	478
Business Notes	480
Wolverhampton Corporation Electricity Works Extensions (*illus.*)	489
Milliken Steel Poles (*illus.*)	493
Our Legal Query Column	493
Notes	494
City Notes	496
Stocks and Shares	500
Market Quotations	500
Share List of Electrical Companies	501
The Electrical Industry in France.—I.	503
Publicity for Small Undertakings (*continued*)	505
A New System of Former Winding for Semi-Closed Slots (*illus.*)	506
Proceedings of Institutions:—	
The Internal Structure of Metals	509
Artificial Load for Testing Electrical Generators (*illus.*)	510
Cost of Electrical Power for Industrial Purposes	511
New Patents Applied For, 1908	511
Published Specifications	512

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Published every FRIDAY Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

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OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 933 Central 4425 (Editorial only).

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOIVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1908 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

INTERNATIONAL EXHIBITIONS.

IN our concluding article on Great International Exhibitions (January 10th, 1908, p. 45), it was suggested that an Association of Exhibitors and others interested in such matters, might be formed not only in the British Isles, but in all our Colonies and Dependencies, on lines somewhat similar to those followed in the case of the Comité Français des Expositions à l'Etranger. In the November, 1907, *Bulletin* of the Comité there is abundant evidence that the organisation is working hard to make a great success of the French participation in the Exhibition at Shepherd's Bush.

As all parts of the British Empire will be represented on that occasion, the results of the Comité's efforts should form a valuable object lesson, and should lead to the formation of similar bodies in time to enable a worthy representation of our arts, industries, and produce, at Tokio, from April 1st to October 31st, 1912. Rivalry will be keen on that occasion, and if we miss so grand an opportunity for showing Japan, China, and, indeed, all other nations, the magnificent possibilities of the greatest Empire the world has ever known, we may be in danger of losing the markets of those vast Eastern regions—markets which are only just opening out.

Associations similar to the Comité Français have been formed in Germany, Hungary, Italy, the Netherlands and Belgium; in the last-named country the articles of association are absolutely identical. A movement is now on foot to federate all these bodies into an International Union, and there is no doubt that this will soon take place. In fact, one conference has already been held in Paris. There will be one in Brussels this year, and another in Berlin in 1909. In the *Bulletin* an account is given of the meetings in November, which were arranged in London between representatives of the Comité and of the Exhibition Committee, when all particulars were settled. At the end of the month the annual dinner of the Association took place in Paris. On this occasion more than 800 were present, as compared with 300 in 1883, and allusion was made to the London Exhibition this year, as worthily completing the cycle of 16 exhibitions, in which the Comité have taken part in the last 20 years. Another series is already started of exhibitions in Brussels, St. Petersburg, Tokio, and Buenos Ayres. It was pointed out at that time, on both sides of the channel, that the Franco-British Exhibition would receive no pecuniary help from the two Governments, and that it would be entirely due to private enterprise, uncontrolled by the State in any way whatever. Since then the French Government has made a grant in aid of considerably over £31,000.

A general plan is published in which the series of seven buildings between the main entrance in Uxbridge Road and that in Wood Lane are apportioned as follows, viz., Nos. 2, 3, 4, Section Anglaise (agriculture et divers); 5

Agriculture Française; 6, Alimentation Anglaise; 7, Alimentation Française; 8, Section Française (Arts Libéraux). The Comité has obtained the space required for its exhibitors. The Municipal Council of Paris has voted £12,000 for a special building, and as 11,000 exhibitors have already signified their intention of being present, there can be no doubt that the French part of the Exhibition will be a great success. A general committee has been formed, but to save the time of the members their powers have been delegated to an executive committee of 21 members, including the president of the Comité, five first vice-presidents, five vice-presidents, four secretaries, two treasurers, four members. The general administration is conducted by Messrs. Maurice Estieu, general delegate; J. de Montarnel, chief architect; and E. de Brevens, administrative secretary. Officers have been appointed to the various groups and classes, of which there are 19 of the former and 124 of the latter.

The general rules and regulations affecting exhibitors are given in full, and some of them are worth noting. The Comité undertake the gratuitous handling of all exhibits of 1,500 kilos and under, including the reception of them at the gates, the delivery at site, and the removal of them after they are packed. A tariff is given covering the removal of empties, their storage, and the delivery on site at the close of the Exhibition. Exhibitors are responsible for receiving and checking their goods. Schemes for display and decoration of exhibits and stands have to be approved by the Comité, who will undertake the general decoration and police duties. The contributions from each exhibitor will cover the rent of their stand, their proportion of the cost of general and special class decorations, and of watching and warding. Any individual extra decoration effected will be at the cost of the exhibitors, who will also have to pay for their own installation, for packing and transporting, for unpacking, displaying, and repacking their goods. French exhibitors will reap the benefit of all reduced rates, whether on French or English railways and shipping.

Advantage should be taken of the presence of representatives from all our Colonies and Dependencies, of merchants and others desirous of fostering both inter-imperial and foreign trade, to endeavour to form a permanent exhibition organisation, the objects of which would be the systematic utilisation of foreign exhibitions for the advancement of the Empire's trade and commerce in those countries in which they are held, and the establishment of permanent home exhibitions in the various parts of the Empire for the development of inter-British trade and commerce. Such permanent installations would form the nucleus of any participation in foreign exhibitions, and would cause the sources and products of the Empire to be locally known to its constituent portions.

On these occasions there could be shown specimens of foreign products which compete with British products in the Imperial and other markets, in the more important producing centres of the Empire. The personal interest of those connected with trade and industry within the Empire should be sought, and all existing organisations should be utilised and their co-operation promoted.

The Duke of Argyll has shown so much interest in all matters connected with the development of trade and industries within the Empire, that he might well be asked to become the first President of such an organisation. His position as Hon. President of the Shepherd's Bush Exhibition has necessarily brought him in contact with all the leading men whom it would be desirable to enrol as working members of the Permanent Exhibition Organisation, and the assistance of the French Comité, with its 20 years' experience would be invaluable, and would, no doubt, be freely given.

There can be no doubt that an organisation on some such lines as we have indicated would prove to be most useful, not only to potential exhibitors, but to the different Governments, both home and colonial, with whom it would co-operate, more or less intimately, according to local circumstances. It is, as we have said, devoutly to be hoped that steps will be taken in time to enable the British Empire to be worthily represented at Tokio in the first instance, and at any future great international exhibitions.

Architecture and Illumination.

In the January issue of the *Transactions* of the Illuminating Engineering Society, New York, there appears a paper on "The Relation of Architectural Principles to Illuminating Engineering Practice," by Mr. Bassett Jones, Jun. The author departs entirely from the hard-beaten paths of candle-feet, inverse squares, "fixture" design, &c., and treats the subject with a dignity and an æsthetic sense rarely manifested in connection with it. Reasoning upwards from the study of the meaning and nature of æsthetics, he shows its relation to human sympathy and imagination, and explains how the perception of the beautiful is based upon harmony, proportion and other qualities. His arguments are illustrated by views of old candelabra, famous interiors, and other examples of applied ornament, modern as well as ancient, his object being to emphasise the necessity of congruity and artistic taste, and the vulgarity of ornament improperly applied. Mr. Jones, in fact, raises the subject to a far higher plane than it is usually discussed upon, and he shows how necessary it is to avoid concentrating one's attention upon small details while ignoring the broad principles of artistic treatment.

The author, however, did not have it all his own way. In the discussion that followed the reading of his paper it was argued that the methods of distributing illumination practised of old would not serve when applied to modern illuminants of high intrinsic brilliancy, which must be dealt with in a wholly different manner; further, illumination that used to be considered ample, would now, in most cases, be regarded as miserably inadequate—for example, in ancient churches, which it was most difficult to illuminate in accordance with modern ideas without doing violence to the amenities. "Illumination may be artistic, but still very bad"—true it is, and so also is the remark that many of the modern stock fittings are larded with stamped so-called ornament too fearful to describe.

The keynote of successful illumination is not the question of foot-candles; it is a question of how much light is needed, and it is more often a question of quality than of quantity. So says Mr. Jones, and it is impossible to deny the truth of his conclusions. Unfortunately, too often there is a lack of sympathy and understanding between the architect and the engineer, with the result that admirable intentions on both sides bring forth deplorable results. It is, therefore, of the first importance that each should make himself as far as possible familiar with the ideas and methods of the other; that the illuminating engineer should be something of an architect, and *vice versa*; and that they should co-operate intelligently, at any rate in the carrying out of important works.

A New Bogey.

We have frequently had to complain of comparisons between electric light and other forms of illumination, which by their inclusion of only part of the costs, present a manifestly unfair statement, yet one which, owing to its apparent simplicity, is calculated to delude the non-technical reader. Electricity is unfortunately situated in regard to the fact that the price per unit, which is the figure that is always presented to the consideration of the outside man by intending competitors, is the figure which is a perfectly fair charge upon the whole costs of the establishment. It includes not merely the net cost of generating processes, but also the interest on capital involved in the installation, the fair cost for efficient maintenance and up-keep of the plant, and a virtual guarantee for continuity of supply and avoidance of danger by the operation of a skilled staff of experienced engineers.

On the other hand, we very often come across statements, more particularly in connection with plants which are put on the market for the purpose of sale for private self-contained

house installations, to the details of which we have to take exception.

The latest case is the exploitation of the new petrol air gas light, which consists of a mixture of 11½ per cent. of petrol vapour and 88½ per cent. of air. Granted that it is non-poisonous, non-explosive, non-corrosive, and possessed of other negative qualities when mixed in this proportion, it should not be forgotten in passing that the storage of petrol in a private house is a state of affairs fraught with considerable danger, more especially when coupled with a mechanical process of evaporation and mixing with air. This part of the business, however, could or should, be left to the unassisted intelligence of an ordinary man who knows what a motor-car explosion is like; but when we get statements such as the following by one who should be a properly accredited guide in these matters, it is time to protest: "The amount of petrol used appears to be one gallon for 1,600 to 2,000 cb. ft. of gas, and as 1 cb. ft. represents about 10 C.P.-hours (that is to say, a light of 10 C.P. for an hour), it follows that one gallon of petrol may yield as much as 20,000 C.P.-hours." After stating that the price of petrol at present is rising, the writer assumes the figure at 1s. 6d. per gallon, and then proceeds to say "this means 20,000 C.P.-hours for 1s. 6d., or about 1,000 C.P.-hours for 1d. Now the corresponding cost of incandescent lighting would figure out on the basis of 3½ watts per candle-power and 4d. per unit, at 70 C.P.-hours for 1d."

The obvious inference from this is that the new gas is over 14 times as cheap as electric light, and the next question to be asked is, When will the electric light stations shut down? Unfortunately, in these alluring figures absolutely no account has been taken of the initial cost of the generating plant, the cost of the gas system, the necessary supervision, the cost of renewal of mantles (the gas is non-luminous), and the cost of insurance which would be demanded by any fire office, were it known that petrol was being stored on the premises.

The absurdity of the so-called comparisons is too glorious to be further demonstrated, but it is this type of one-sided statement which recurs to unsettle the mind of the public as to the advantages of electric light.

Manchester Exhibition.

We mentioned in our last issue that a rumour was current in the provinces to the effect that the Manchester Electrical Exhibition was not likely to be held this year. From information that is now placed before us by the official representatives, we understand that it may "practically be said that the difficulties which at first presented themselves to the Executive Committee have now been overcome," and that final details in connection with the forthcoming exhibition have assumed definite shape. By arrangement with the Manchester Corporation Parks Committee, a site has been secured on the Platt Fields Estate, and we understand that at a meeting of the Sub-Committee in London on March 9th, various builders' estimates were under consideration, and it was agreed that the matter should go forward.

A general meeting is being called in Manchester for Tuesday next, March 24th, with a view to adopting the resolutions of the Sub-Committee, and carrying same into effect. We are informed that draft prospectus and plans of floor space available for exhibitors are being prepared, and naturally, it would materially assist all those interested in the organisation of the scheme if would-be exhibitors would advise the management definitely as to whether they desire to take part in the movement, which, it is said, has already received sufficient promises of support to warrant an assured success.

As the total floor space of the proposed building will be somewhere about 100,000 ft., not only will there be room for a thoroughly representative display of electrical apparatus, but it will also be possible to exhibit a good deal of machinery and mechanical plant, to which electricity as a motive power may be readily and successfully applied.

The authorities invite the loyal support of the industry and trade generally in regard to this matter. It is clear, however, that it will only be possible to accurately gauge opinion by representative firms making their views known before the meeting which is to be held on the 24th inst. To say that they will *not* exhibit might be a more useful attitude than to keep silent. Some may be of opinion that the scheme is too ambitious in its proportions, or that it might be better to defer it until 1909. In the latter event, it must be borne in mind that 1910 is the year of a proposed electrical exhibition in London.

Theft from a Factory.

The system of organised theft disclosed at the Central Criminal Court last week, whereby the Telegraph Construction and Maintenance Co., Ltd., were robbed of gutta-percha to the value of £5,734, is one of the most remarkable and at the same time one of the most disquieting criminal cases that has been revealed in modern times. The fact that in a single shop in a London factory from six to a dozen men could be found willing to apply themselves to deliberate thieving, arouses distrust and gives rise to the question as to the extent to which the average factory labourer is honest. On the other hand, it has to be admitted that the men concerned in this particular robbery were working under circumstances of very great temptation, and that they were led into mischief by a leader of considerable cunning. Moreover, the crime was further fostered by the facilities offered by those who received the stolen material. The case has arisen in a factory associated with the oldest branch of the electrical industry, but we venture to think that it has lessons even for the most modern factory. It is important that the interests of the owners of such material should be guarded, but it is even more important that the men should, so far as possible, be removed from the possibility of committing easy theft.

It is instructive to note how the gutta-percha was obtained and how it was sold by this gang of thieves. The material, in rough lumps or in rolled sheet, lent itself easily to be formed, hot or cold, into pieces that could be secreted under the waistcoats of the men. The witness Eden, a self-confessed accomplice, explained that there was a good deal of steam about in the shop, so that there was little difficulty in hiding this manœuvre. In this manner he had been able to remove 10 or 15 lb. at a time, when leaving at the breakfast hour. The actual wholesale value of the gutta-percha was said to be 4s. a lb., but the workmen who thus stole it obtained only 5d. a lb. Each such thief removed from 30 to 60 lb. a week, and they received the payment every Saturday. Eden was earning 23s. 10d. a week as wages, so that it would appear that the robbery enabled the men approximately to double their incomes. For them, therefore, it was a considerable temptation.

The organiser of the plot was Charles Boniface, a former workman in the same shop, who lived in a small private tenement, rented at 6s. a week. To this tenement the representative of a firm of dealers drove with a van every other week or so, removing each time something like 1 cwt. Subsequently it was paid for in cash, the money passing from Mrs. Merchant to Mrs. Boniface. The representative, McKnight, appears to have considered it no concern of his as to the origin of the gutta-percha. And between August, 1905, and January, 1908, this firm seem to have sold to a second firm £5,734 worth of this material. The Recorder described Merchant's premises as "the house of the really guilty people." There was no reproach upon the second firm.

Unfortunately, the evidence was almost entirely that of Eden and Mrs. Boniface, both of whom were accomplices. The Recorder reminded the jury that for centuries in this country it had been the custom, though not actually the law, to regard such tainted evidence as insufficient, unless it is supported by material corroborative testimony from honest witnesses. The jury accepted this position, and the result was that most of the prisoners were acquitted, and no criminal proceedings were taken against the receivers. The Recorder, however, directed the police to keep observation upon the premises of McKnight.

BULK SUPPLY IN GREATER LONDON AREA.

By J. HORACE BOWDEN and FRED TAIT.

Section III.—Suggestions for Prospective Bulk Supply.

Having at some length compared practice with hypothesis, much, it is hoped, to the detriment of the latter, and having, it is also hoped, proved beyond doubt that gradual expansion within the local area is the most economical known method of distributing energy for power and lighting purposes, the writers suggest that it is possible to assist existing undertakers to supply in a more economical manner by the establishment of a central stand-by station or stations, common to all authorised distributors within a given area, and controlled by a central authority, making provision against reserve and stand-by plant and immediate future demands, and supplying energy for intermittent peak loads. The benefits to be anticipated are, reduction of capital expenditure and cost of production by individual undertakings.

The fundamental principle of central supply in any area is simply co-operation. It is an established fact that the individual can produce electrical energy quite as cheaply as the undertaking can supply, or, if the individual plant is large enough, as cheaply as the supply undertaking can generate, thereby saving distribution losses, but in order to ensure continuity of supply duplication of plant is necessary, so to minimise the expenditure of non-revenue-earning capital, it is policy to unite interests and take supply from a central source.

If it were assumed that all consumers could take a supply under exactly similar conditions as to time and quantity, thus making no diversity whatever, it is probable that a saving would be shown in favour of central supply by a net reduction of capital expenditure on account of reserve plant. But if consumers were divided into, say, three classes, and each class made an equal demand upon the plant at three different periods of the day, thereby creating a diversity factor of three, the saving to the individual would be much more pronounced. Then, again, consumers do not make their maximum demands at the same hour or on the same day in the year, therefore a still greater advantage accrues on this account to the system of central supply. Thus by the union of diverse requirements is a central supply undertaking built up, which has proved amongst small consumers to be the most economical method within local areas.

It is, however, highly probable that a large user of energy with a nominal 100 per cent. load factor could, without making provision for reserve plant, generate more cheaply than a supply could profitably and equitably be given by a central undertaking, by saving the cost of transmission and transmission losses, and if we assume that such a user could, instead of providing reserve plant at a probable cost of 8 per cent. per annum for interest and depreciation, insure against all risk of breakdown by a stand-by connection to the undertakers' mains at, say, 1 per cent. of such cost, and, if motive power had been laid down, to cope with emergency business at brief periods of the year, and could avoid laying down generating plant by taking the requisite power at such times from the central undertaking, there is not the slightest doubt that such a method would prove the most economical to such an individual.

By the law of analogy the writers would apply this method of reasoning to the problem of bulk supply. If it be assumed that authorised distributors can be placed in the same category with individual users of energy, and can by co-operation, within an area bounded by the limits of economical transmission, lay down a stand-by or central auxiliary station, and there place the whole of their reserve and stand-by plant, calling upon such a station when and as required, an equivalent benefit would result to existing undertakers as it has been shown would accrue to individual users under similar conditions.

A distinction has been drawn between reserve and stand-by plant, a distinction upon which a confusion of ideas sometimes exists. Reserve plant may be taken as that provision made against the breakdown of the largest plant units and the probable near future demands. Stand-by plant is that which is provided for heavy demands during that period of the year when the power and lighting loads overlap each other. The probability of a coincidental breakdown amongst a large number of undertakings is remote, and is divisible by a large diversity factor.

The aggregate maximum demand upon all authorised distributors in the Greater London area in the year 1905-6 is contradictorily stated in the London County Council tables as 131,783 kw. and 132,287 kw., but the actual maximum demand is an unknown quantity.

It is highly probable that, if the actual *hour* and, of still more importance, the actual *day* on which the maximum demand occurred in the various areas were ascertained, the actual maximum demand upon the whole area would be considerably less than that represented by a diversity factor of 1·5 upon the aggregate maximum demand.

In the year 1905-6 the reserve plant in Greater London Area was equal to 53·1 per cent. of the actual plant used, representing a capital expenditure on generating plant of £3,157,091.

If the actual maximum demand were ascertained it would probably be found that the excess stand-by plant would more than equal this amount. In an auxiliary central station probably not more than a tithe of the non-revenue-earning reserve plant would be necessary, and the whole of the excess stand-by plant would be saved.

It is not the intention of the writers to deal with the cost of supply from the suggested source, as it is impossible for the individual to successfully compute results which can only be obtained by co-operation, but the immensity of the loss engendered by dormant capital expenditure suggests the necessity of a union of interests amongst existing undertakers and the formation of a central board of control upon which each co-operating undertaking would be represented.

Probably the greatest benefit that the proposed form of bulk supply would confer upon existing undertakers is the fact that it would be possible gradually to build up a load upon the auxiliary central station, and, when it was of sufficient proportions to fully load up an extension of plant, transfer the ready-made load to the local undertaking. It is a serious handicap, having loaded a station to its full effective capacity, earning the requisite amount of profit commensurate with sound finance, to be compelled to lay down extensions of plant which must of necessity provide for future years and thus diminish the profits by payments on account of non-revenue-earning capital until the fully-loaded stage is again reached.

Within the area of the dimensions suggested, a large number of undertakers exist, and as in most instances the building-up process would be gradual, it is quite possible to conceive that a considerable diversity would occur in the dropping-off process, thereby effectually rendering the system economical.

It should also be borne in mind that a saving in the standing charges upon an undertaking is not the only advantage to be derived from the proposed system of auxiliary supply.

As it would be necessary to keep the proposed station always in a state of readiness to supply, it would be possible to run individual plants at a load factor of 100 per cent. during the principal portion of the day. The necessity for keeping boilers up to pressure in readiness in case of breakdown or for an anticipated load that is not realised would be eliminated. It would not be necessary to run uneconomical units whilst effecting repairs to machinery. It would be possible in many instances to shut down entirely during Sunday instead of merely keeping mains alive at a heavy cost, as is now necessary.

There is one important factor in this problem that is generally overlooked. The majority of authorised distributors possess one central station only, and in many cases the plant is still in its years of infancy, and repairs and alterations are now comparatively unimportant. As the useful life of the plant nears its end, breakdowns will become more extensive and more frequent, and the advantage of being able to close down completely in order to carry out necessary repairs will appeal to all engineers.

The effect which the advantage claimed would have upon the running costs of existing undertakers is difficult to compute, but when it is considered that, on the basis of the aggregate output within the area for the year 1905-6, every

0·1d. per unit is equal to over £84,000 per annum, this saving would undoubtedly be considerable.

The writers, whilst admitting that there may be many points in this article open to much discussion, have endeavoured to follow, as far as possible, logical conclusions, and have refrained from putting forward any suggestion of a hypothetical nature. Generally their statements are substantiated by facts, but where conjecture has been necessary, it has been put forward on analogous lines.

The subject has been one requiring more than passing thought for, although their views are the same to-day as two years ago, it has, as previously stated, recently been necessary in the course of their duties to give the matter that serious consideration which actuates the policy of an electricity supply undertaking, and they have come to the conclusion that no proposals have yet been made that would in any way assist undertakings similarly situated to their own to supply energy in a more economical manner than by extensions to existing plant.

It is their firm conviction that not only might considerable assistance be obtained by the adoption of the policy suggested, but it would also successfully end the constantly recurring Parliamentary proceedings in connection with abortive schemes, costly to promoters and opposing undertakers alike.

CORRESPONDENCE.

Letters received by us after **5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Proposed Engineers' Association.

The meeting to discuss and promote the above Association will be held on Wednesday, March 25th, at 7 p.m., at 25, Victoria Street, London, S.W.

It is hoped that all engineers, draughtsmen, &c., desiring to promote the interests of the profession will attend. The result of this meeting will determine the future of the organisation.

Committee and Organiser.

I have read with considerable interest the various comments made by your readers respecting "improving the status of shift engineers" and others of like degree, and particularly the remarks made by "Organiser" in last week's issue; and I wonder whether "Organiser" and other interested gentlemen have ever heard of the Association of Engineers-in-Charge. Surely, after the very many valuable notices you have given us in your journal, and the position we hold to-day in the minds of most of the eminent gentlemen connected with the electrical and mechanical world, our sphere of influence and our work of education, improvement, and gradual building-up of the status of all engineers, cannot be unknown to a vast number who are seeking for some organisation. It is within my memory that you entered into an arrangement about two years ago to receive names of gentlemen who were prepared to meet the officials of this association to discuss alterations to rules, to enable electrical station engineers to amalgamate, and you kindly lent your columns to our present chairman, Mr. A. Davey, to put forward an appeal to that effect. The matter died away with those we were desirous of co-operating with, but it did not die with us. Our rules were amended, and we have at the present moment many electrical engineers throughout the country as members, and are enrolling more; and a glance down our programme will show that one of the greatest central station engineers is president of the association at the present moment.

All that "Organiser" has mentioned, and more, is really in existence, and it seems to me that it is only necessary for them to enroll to find that thirteen years of hard toil would be of some advantage to them instead of starting an opposition society. If there are any who desire to know more, we shall be pleased to tell; and any letter addressed to the hon. secretary, Mr. Hy. Capsey, at St. Bride's Institute, Bride Lane, E.C., will receive appreciative consideration; or I know, Sirs, that you will still be ready to receive any names of gentlemen who would like to meet a deputation in order to know more about us.

Thanking you for your many favours in this direction, which I regret have not, apparently, been noticed by those interested.

Alf. E. Penn,
Chairman of Educational Committee, and Vice-Chairman of the Association.

London, E.C., *March 12th*, 1908.

I have not had time to take up the above matter again until now, but I have in the meantime been watching the correspondence in your excellent paper on the subject.

I am glad so many brother engineers are of the same opinion as myself, but I should have been better pleased if more had taken part in the discussion, as we have had practically no helpful suggestions.

One or two correspondents have raised points which I think would bear more discussion. Taking the letter of Mr. Cutts first, he complains of sons and friends of directors, &c., holding engineering posts in stations.

I think we must all realise that engineers are born, not made, and if a man has not the brains or taste for engineering no amount of training will make him one; such a man only becomes a nuisance. In my opinion it matters not whether a member is a director's or committee-man's son, his qualifications must determine his membership, and this brings me to one of the knotty points on which I should like to have suggestions, viz: The ways and means of ascertaining a prospective member's qualifications.

It seems to be that in the end we must have legislation on the whole business; it has been suggested that the Board of Trade should hold examinations and grant certificates to supply engineers, but this would be of little use unless supply undertakings were compelled to employ only certified engineers in the more important positions, such as, the chief, the shift engineers, the head mains engineer, the chief of the meter-testing and house-wiring department, the power department, &c.

Further, employers should be compelled to furnish an exact copy of any letters passing between themselves, referring to the qualifications of any employé, to any employé asking for same.

This latter is very important; such a clause would knock on the head the pernicious system of confidential letter-writing, which is resorted to by a large number of chiefs, &c., at the present time, and is, I am convinced, very harmful to assistants.

However, until we can get legislation I am afraid we shall have to adopt these confidential methods ourselves to a certain extent, in selecting the members of the proposed association.

Returning to Mr. Cutts's letter, I forgot to say that in the case of a member being a director's or committee-man's son, he must on no account take promotion at the expense of another by reason of his influence; this is the danger where the whole family are engaged in one concern.

Your correspondent "Efficiency" takes exception to my denouncing Protection and the Cable-makers' ring and advocating combination for assistant engineers, but he does not make any suggestion for a better course of action, and goes on to advise me to have nothing to do with politics. Here I entirely disagree with him; I hold that it is the indifference of engineers towards politics that is the cause of a lot of our troubles, and I fancy he will find a great many more of the same opinion.

In further reference to the business of forming an association, my idea is, that we should have an organiser in all the large centres, say, London, Birmingham, Manchester, Newcastle-on-Tyne, and Glasgow.

I think shift engineers in large stations, who only do six shifts per week, would be the best for this purpose, as I fancy they would have a little more time on their hands than assistants in other departments. These

organisers should personally visit all the stations in their district and gather information on the spot, and report to headquarters.

"Organiser" in the current issue suggests a meeting, but I do not think this would be altogether convenient for a large number, myself included, and as I am at present resident a long distance from any of the above-mentioned centres, I regret I cannot do a great deal in the way of getting members. I shall be pleased to communicate with "Organiser," but before doing so I shall be glad if he will let me know through you, Mr. Editor, if he is stationed near either of the above centres, and which.

I hope to see letters from more assistant engineers in your next few issues, offering some good suggestions.

Electricity Supply.

May I draw the attention of those concerned in the proposed engineers' Association to the fact that there exists a similar association in Germany, called Bund der techn.-industr. Beamten, which was founded in 1905 for the purpose of raising the standard of salaries and conditions under which the technical employés had to suffer.

That there was not less necessity for such an institution in Germany than there is in England may be seen from the rapid increase of the number of members, which by this time amounts to 11,000.

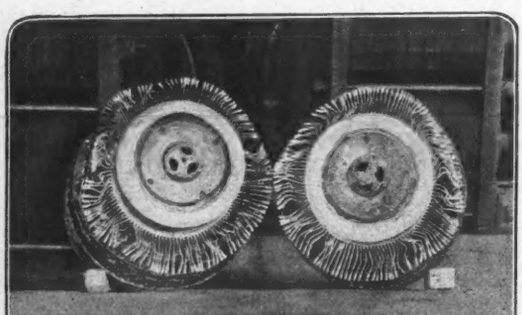
Much good has been done by this association in the past three years, and I would suggest entering into communication with them in order to obtain particulars about the lines on which their association is based. These might be useful, notwithstanding the different conditions prevailing in the two countries.

Associate.

Packing for Export.

Re your recent article on packing of machinery, what price this (photo enclosed) ?—a pair of armatures recently received.

Regaes.



Armatures as Received in South Africa.

[It is a pity that our correspondent has omitted to mention whether the "packing" of these unfortunate objects was British or foreign.—Eds. E.R.]

Heating Water by Electricity.

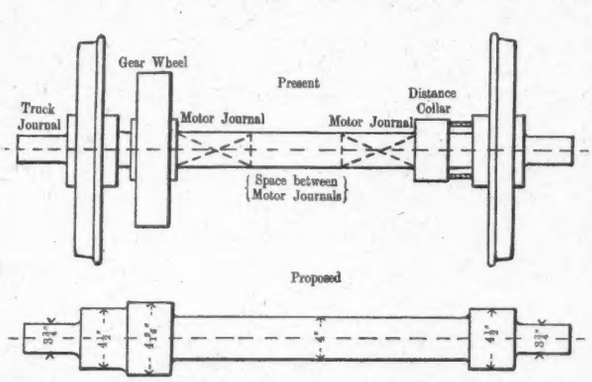
I should be much obliged if any of your readers could give me particulars with respect to the heating of water on a large scale, such as is required in distilleries, breweries and other works, by electricity ; the names of the makers of such apparatus, and where the apparatus is in use ; also any comparative actual figures with respect to the cost of heating water by steam and electricity.

Horace Boot.

Car Axle Breakage.

Having read an article in the current number of the Review, headed as above, I should like to make a few comments thereon.

Railway Wagon Axles.—It is not possible to compare a railway wagon axle with one of an electrically-driven vehicle. If comparisons are required to be made with railway stock, they should be with the steam locomotive. It should be noted that a railway wagon axle is a trailing axle and not a driver. It is not possible to taper off an electric car axle as you suggest, even if one should wish to do so, as there is not space enough to carry it into effect. The electric motor takes up most of the space between the wheel hubs, and, by reason of its two suspension bearings, stiffens the axle and thereby prevents bending, that is, of course, so long as the bearings are not worn to any extent. The only free portion of the axle is that between the two suspension bearings, this portion having a length of some 16 in. to 17 in., with a 4 ft. 8½ in. gauge, and being reduced to 11 in. or 12 in. on a 3 ft. 6 in. gauge (see fig.) This distance is too short to enable any reduction of diameter to be of any benefit. In a wagon axle the whole length of about 48 in. or 50 in. is free for the purpose of bending when constructed tapering from the centre outwards towards the wheel hub.



Axles for Electric Tramcars.

Wheel Bore.—It is quite correct that the bore at the back of the wheel hub should be given a radius, and it is necessary that this should be a large radius, approximating more to a curve as regards its relation to the bore, and not a small radius of, say, ⅜ in., which leaves the bore in almost as bad a condition for nipping the axle as if no radius were given at all. To ensure a proper fit between wheel and axle so that the wheel shall have no chance of moving when once pressed on, the wheel seat and bore should be machined parallel and not tapered, and the pressure that the wheel should be put on with should be from 7 to 10 tons per inch diameter of axle.

Haste, &c., and Builders.—It is very difficult to make any advance on certain details of car construction which entails additional cost, unless all builders agree to do so at one and the same time, as notwithstanding the many years' experience that has been obtained in electric traction, most engineers and managers still prefer to buy in the cheapest market with the inevitable result. There are, however, signs of a change gradually occurring in this direction. If methods do change and there is shown to be a call for improvement in details which the customer will be willing to pay for, all manufacturers can rise to the occasion with very little difficulty.

Correct Methods.—It is not difficult to lay down the correct method to be adopted if the customer is willing to pay for it. The wheel seat should be bossed up, say, ½ in. larger in diameter than the diameter of the axle in the motor bearings, and the wheel should be pressed on, with a radius provided at the back of the bore. The gear wheel should also be pressed on to a correspondingly enlarged diameter, say, $\frac{1}{16}$ in. larger than the wheel seat, so as to enable the gear to pass over the wheel seat when being pressed on. The gear should also be pressed on without a

key. We should then have an axle, say, 4 in. diameter in the centre at the motor suspension bearings, a gear seat of $4\frac{5}{8}$ in. diameter, the two wheel seats $4\frac{1}{2}$ in. diameter, and the outer truck journal $3\frac{1}{2}$ in. or $3\frac{3}{4}$ in. diameter, preferably the latter.

I herewith enclose a sketch showing the present arrangement, which illustrates my remarks under clause "Railway Wagon Axles," and also a sketch of proposed arrangement under clause "Correct Methods."

R. H. Simpson.

Rugby, *March 10th*, 1908.

Carbon Filament Lamps.

I shall be obliged if any of your correspondents can inform me whether the current consumption of a carbon filament lamp increases after the lamp has burned 600 or 800 hours. It is the case, of course, that there is an increase in the "watts per candle"; but although there is decreased illumination, that does not necessarily mean increased cost for current. My point is this, is the meter affected as well as the candle-power? Text-books appear to differ on the point. I have been assured by men in the trade that they have proved by experiment that, in addition to lessened candle-power, there is an actual increased consumption of current if a lamp is kept burning after it has lost 20 per cent. of its original candle-power efficiency. Perhaps some of your readers can give information on this point.

Sub.

[There is frequently an increase of current during, say, the first 50 hours, at constant voltage; but at later periods, when the filament has begun to deteriorate, its resistance increases and the current diminishes, as well as the candle-power. The watts per candle-power, on the other hand, increase.—Eds. E.R.]

Generating Station Engineers.

Having read with considerable interest Mr. Frank Ayton's article on "The Maintenance of Power Station Plant" in your issue of the 21st ult., I was somewhat surprised to find that the capacity of the generating station was only 1,500 kw., instead of 15,000, which one would imagine was a suitable size for such a highly organised undertaking. One is tempted to wonder what the duties of the chief engineer will be when this elaborate system of written reports, special forms, and divided responsibility is in thorough working order.

Steam Tug.

Most station engineers have for years been amused at the idea that marine engineers are the only sound mechanical men in existence, and although no one would wish to deny that the marine engineer usually has very sound knowledge as a fitter, I should like to point out most particularly that his mechanical experience and training have been chiefly obtained on land and *not at sea*, and I fail to see what there is in their sea experience that should make them such superior mechanics, seeing that really difficult repairs are generally carried out by the "shore gang."

Engine driving at sea is very similar to engine driving on land, and, during 15 years' experience in responsible positions, I have found the "land mechanic" and engineer quite as sound in mechanical knowledge as any marine engineer.

Also, the plant in use in generating stations is of a different class to that in use at sea, and the land engineer has usually a far better knowledge of station plant than any marine engineer, even though he may possess an extra first engineer's certificate. Moreover, I contend that of marine engineers the best class stop at sea, and those who enter, or try to enter, central stations are more usually the inefficients.

If Mr. Ayton likes lecturing so well, why does he not lecture on mechanical engineering to electrical fitters, &c., and thus turn them into efficient station engineers?

I think that electricians may reasonably complain that Mr. Ayton did not give them a chance of completing their education by a suitable course of lectures on mechanical engineering.

To sum up, I may say that I totally disagree with Mr. Ayton's views on the matter, and have found most engine drivers and fitters on land to do their work efficiently. The only case I know of a serious smash-up in a central station, was caused by the ignorance of a driver who had been a marine engineer and who also possessed a first engineer's B.O.T. certificate.

A.M.I.E.E.

March 4th, 1908.

The majority of your correspondents who have criticised my article do not appear to agree with my views on central station organisation. Now I didn't suppose they would—some people do not take readily to ways a little out of the ordinary, and some, it appears, would even think them funny! And surely the gentleman who descends to personalities doesn't think I am going to take any notice of his letter?

Most of your correspondents seem a little sore at the idea of marine men being employed in central stations. One of the most successful stations in the North employs marine shift engineers, and I believe there are several other stations where the same system has been in operation for years. And when more chief engineers realise the advantages of putting mechanical engineers (whether they be marine or land mechanical engineers to my mind matters little as long as they have the necessary experience, but the right man is more easily obtained, I think, from the mercantile marine) in charge of the shifts, then more stations will be worked on these lines. However, in spite of this, your correspondents need not despair—there will always be room for the properly trained electrical men. They must be in charge of the mains department, and in very large stations, which can afford the expense, there will probably be an electrical as well as a mechanical engineering staff in the power station, while the management must always be in the hands of an electrical engineer—at least those are my views.

In the modern central stations—I will leave out of account extra high-tension stations—which portion of the plant requires the most attention? I think it will be granted that electric generators turned out by any first-class firm to-day need no attention but what can be given equally well by the purely mechanical man as by the electrical man. The efficiency of the machine is fixed in the design, and provided the armature is kept in proper alignment, the brushes set correctly, and the commutator kept in good condition—all things which a mechanical man can easily do—the efficiency does not alter. Is it so with engines, condensing plant, boilers, pumps, steam pipes and the many steam fittings such as traps, valves, &c.? Of course, it is not; rings wear and allow leakage, bearings require adjustment and re-metalling, steam joints require re-making, boilers must be continually overhauled, and a host of other matters require continual attention on the mechanical side of the station, if good results are to be obtained. The greatest losses occur in the mechanical portion of the plant, and to ensure economical working proper control of the firing is essential. I would ask your correspondents which is the better class of man to employ in charge of a shift, remembering that one must always have an electrically trained man on the switchboard? To my mind there is no doubt as to the correct answer to this question. The aim of the engineer should be to make the undertaking he is in charge of a commercial success. With that in view, I do not hesitate to say that, in my opinion, the mechanical engineer gives the most satisfactory results on the cost sheet and in the general efficiency and reliability in operating the plant. And, whatever your correspondents may think, my opinion is backed up by actual experience. But I should be the last to say that there are not electrical engineers possessed of large experience in steam engineering, and equally capable of obtaining such results. There are no doubt many such men; but when an electrical man has these qualifications, he naturally, and quite properly, commands a much higher salary than the chief of the

average provincial station is allowed to pay to a shift engineer. The marine engineer is generally in the prime of life when he leaves the sea—also, more often than not, he is married. Therefore, when he gets a shore job he sticks to it and settles down. Constant changes in the station staff are in every way undesirable, but the young electrical shift engineer, isn't he always on the look out for a new job? And who would blame him for wanting to get on? I certainly do not. Nevertheless, the fact remains that the constant desire for a change is not good for the working of the station. The marine man settles down and, as he gains in electrical experience year by year, he becomes more valuable.

From the contents of some of your correspondents' letters one would gather that the only type of marine engineer they have come across has been the sort of grimy individual one sees in the engine room of a penny steam-boat or a small tug. Let me assure these gentlemen that the engineers whom shipowners send to sea in charge of the machinery of ships costing anything from £100,000 upwards, are not of that stamp; and I, for one, am somewhat particular as to the qualifications of those I engage. Further, I would say that I do not engage a marine man simply because he has the B. of T. ticket—that means nothing without the experience. The only men I get are those who have served for years in big ships as either chief or second engineers.

I should like to make it clear that the electrical men I have had in the station previous to the marine men have been excellent as far as electrical engineering went—they have been hard-working, willing fellows, and in experience comparable with men of their age to be found in any other stations. I should greatly regret if anything in my article should have appeared to do an injustice to these young engineers.

One of your correspondents threw some doubt on the possibility of obtaining satisfactory voltage regulation with our system. Allow me to assure this gentleman that our voltage regulation will compare very favourably with that of any other supply station. We get long life from Nernst and tantalum lamps, and I have actually had just over 2,300 hours of burning with a pair of Osram lamps, and without any appreciable blackening. This should be a sufficient answer to your correspondent. Perhaps, however, I ought to add that there is an apprentice on the switchboard who, during the daytime, regulates, while the switchboard attendant is attending to his other duties in the station, or about the board. Needless to say that on the evening load the switchboard attendant does not leave the switchboard.

In conclusion, let me assure your correspondents that my system gives excellent results in this station.

Frank Ayton.

Electricity Works, Ipswich,
March 16th, 1908.

Our Home Trade.

I have read your leading article this week on the above with interest, and, as one who holds different views from yourselves on the question of Free Trade *v.* Protection, I am particularly gratified to observe that the general trend of your remarks seems to favour the exclusion of foreign-made stuff from our markets. It is, I am afraid, useless to appeal to buyers on sentimental grounds, and I am at one with a great number who believe that German machines should compete in the British markets on the same terms that British manufactures do in Germany.

However, even under the existing conditions, it is really surprising that any business man should pay better prices for foreign stuff, although in the case of corporation contracts the reason is not far to seek. The engineer proposes to go in for some large extension, and in cases is so plumed with the idea of his own importance, that he imagines that no company in this country is able to make a unit to suit *his* requirements. The matter in due course is referred to the Electricity Committee, elected from the Council, whose knowledge in electrical matters is of the very slightest, and this committee upholds the engineer's recommendation, and congratulates itself on having such a clever man as engineer!

It might pay Corporation engineers who are considering offers for Continental machinery, to inquire into the opinion of their merits held by, say, the Glasgow Corporation, who some years ago spent some £12,000 in motor-generators, and also to trace any repeat orders! As you aptly remark in your article, "Once bitten, twice shy." This contract, I have good reasons to believe, was placed abroad against the engineer's desire, and was settled on price; the engineer's opinion, however, was fully borne out by results.

At the present crisis in the electrical industry, and with the scrambling for orders by home manufacturers, it is certainly very trying to see orders going abroad at prices which carry a fair margin of profit, but the remedy lies in our own hands, viz., Tariff Reform.

A large number of manufacturers at the present moment are more exercised by the competition of their home neighbours, so let us hope that some working arrangement will soon be come to, whereby prices can be maintained and the present insane competition cease.

Onlooker.

Automatic Starting Switch.

In your issue of March 13th, I read an account of a new automatic starting switch which has been designed and patented by Mr. Frank Broadbent, M.I.E.E. In describing the disadvantages of solenoid apparatus up to the present, the following appears:—"Other disadvantages are that it is not possible to provide the switches with a no-voltage release. For overloads it is also necessary to rely either upon a separate circuit-breaker or upon the fuse, as any ordinary overload release which merely dropped the switch arm would not prevent the switch from immediately starting up again. Under these conditions the switch would merely pump up and down when the overload came into operation."

It may interest your readers to know that I have a switch of my own design and fitting working in connection with solenoid starting apparatus on a printing machine which has a no-voltage release, and I have fitted an overload release to work in connection with it. It is designed so that the switch arm drops if the fuse blows, if the shunt current fails, if the overload comes into action, and also in the event of a failure of the supply. The switch arm does not rise again until the operator moves his switch to the "on" position. Inching of the machine is easily done, and the machine can also be stopped from a number of points if necessary. This has been working successfully for the last 12 months.

O. Holt, *Chief Electrical Engineer.*
W. H. Smith & Son, London.

March 16th, 1908.

Wireless Telegraphy.

I observe from the Editorial note which follows my letter published in the Electrical Review of March 6th, that you again allude to certain remarks reported to have been made by the Postmaster-General. The following letter, which was written in reference to my last Friday's lecture at the Royal Institution, may, perhaps, reflect more accurately the views of the Postmaster-General:—

General Post Office, London,
March 12th, 1908.

Dear Mr. Marconi,

I much regret that a previous engagement prevents my being present at your lecture on Friday.

I should like to have had an opportunity, as Postmaster-General, of bearing testimony to the work you have done and are doing.

How soon, and how far, wireless telegraphy can be utilised for internal telegraphic purposes yet remains to be seen. But the working of the two Post Office installations we have in operation—one on the Marconi system—is evidence to us of the steady improvements that are being made in the development of wireless telegraphy, while the opening of the Marconi Atlantic station marks another step in advance in the case of long-distance communication.

Yours very truly,
Sydney Buxton.

If any further evidence is wanting as to the reality of our trans-Atlantic wireless service, perhaps the following extract from a communication, which I have recently received from the *New York Times*, may not be irrelevant :—

. . . . During the past five months . . . . the *Times* has received from its correspondent in England, and on the Continent, news despatches totalling 68,404 words, promptly and efficiently transmitted by your system.

The originals of the communications cited above can be seen at our office.

G. Marconi.

London, W.C.,
March 16th, 1908.

Peak Batteries.

I would like to comment on a remark made by Messrs. J. H. Bowden and Fred. Tate in their communication (page 384) on the "Bulk Supply of Greater London."

As a side issue to the main subject, they state that private battery installations might advantageously be used for the purpose of reducing the consumers' peak, and they predict a future for the system.

The idea certainly deserves consideration when taken in conjunction with a power system on a large works, or in docks, but I fear there is very little hope of reducing a consumer's costs by this means, if the demand is chiefly for lighting purposes.

I was asked some time ago by clients in Marylebone to report on a proposal of this nature, and after careful investigation, I found that, whether the battery were installed merely to take the peak or whether it were large enough to deal with the whole load from dusk to 10 p.m., and were charged with cheap current during restricted hours, the proposal was commercially unsound.

For such a purpose the battery must be of large capacity, otherwise in foggy weather the peak would fall upon the outside mains. A rating of nine hours' capacity when new, or, say, seven hours' capacity when in regular use, should be allowed.

Such a battery with booster, switchboard, &c., would cost from £33 to £45 per kilowatt, according to size.

Working on the cheaper price, which is the cost of a 100-KW. battery with accessories, I find that the yearly charges for capital, maintenance, depreciation, rent and attendance would amount to about £7 per kilowatt, a price well in excess of the charge made by most undertakers, directly or indirectly, on account of plant rental.

Apart from this high cost, it must be remembered that the current passed through the battery would cost about 35 per cent. more than that delivered direct.

A. D. Stevenson.

London, S.W., *March 17th*, 1908.

Non-Professional Engineers.

In glancing through your "Correspondence" columns I note that some peculiar person, who calls himself "Efficiency," has made an attack on training institutions, more particularly Faraday House. I passed through none of these myself, but my extensive connection among municipal and station engineers gives me an opportunity not only of knowing many men who have received their training at Faraday House, but also of hearing from them the progress made by the pupils at the present time.

Having this knowledge, I must enter a protest against the innuendos which your correspondent employs. I admit he has a perfect right to express his opinion of the question of premium pupils, but to insinuate that those from Faraday House are not carefully placed and properly looked after is, to those who are acquainted with the facts of the case, evidence of his absolute ignorance of the subject.

Your anonymous correspondent appears anxious about the status of the profession. If he carries into his work the methods he employs in his correspondence in your columns, I share his anxiety.

Haydn Harrison.

London, S.W., *March 9th*, 1908.

The present correspondence in these columns shows that there is a strong feeling of resentment against the type of man undergoing criticism. Whether the whole affair will end by quietly dying—unfortunately these serious matters have a tendency that way ; or whether it will end in, or should I say whether it is the birth of an organisation that will be a power in the land, will depend entirely upon those who can rightfully term themselves professional men. This moment is undoubtedly a tide in affairs which must be taken at the flood, and if only all concerned will shake off any fear they have of identifying themselves with this movement and assert their individuality, which is their natural heritage, they must eventually benefit by it.

I refer to individuality, because that quality is undoubtedly the essence of the fruit of one's work. Let it once die or become subdued and as clay in the hands of others, and you immediately put a full stop in front of your career, and at the same time make yourself one of the thousand and one props that keep other men up ; also you become a coward, self-reliance gives way to fear and a feeling of dependence on others ; practically speaking, you become mechanical, and when you are that, well ! You are the type of man the non-professional man wants—a combined rung in his ladder and door mat when he wants one.

Lack of interest in one's work is, to a great extent, the cause of the present trouble. The average man has a knack of doing just as little as he can ; just enough to pull through with. He is inclined to "let things slide" if they are a little harder than he cares for, his motto is "avoid worry." Possibly he thinks it shows independence on his part, but that's where he fools himself ; it's pure laziness and a sign of mental deficiency—lack of individuality.

There are two reasons for this pervading spirit of slackness :—either it is born in the man that need not be commented on—or else it is forced upon him by his superiors by their crushing out any sign of originality which shows itself ; if a man shows any sign of real interest in his work, they seem to look upon him as a rival for their position, and either trade or tread on him, and the man is either forced to throw up his position or knuckle under. It is a great pity—such a man is an asset to any business, but as long as there is this great feeling of mistrust, which is so terribly misplaced, these cases will always be ; only when non-professional men are weeded out of the engineering world will a feeling of brotherhood and confidence spread. We are living in a mechanical age, and at present, man, as its creator, instead of rising above it is becoming part and parcel of the huge mechanism.

Douglas A. C. Bailey.

Home Office Inquiry.

With reference to the inquiry which is being held relating to the Rules which the Home Office propose issuing regarding the use of no-voltage release switches, we are exceedingly surprised to see from the evidence reported in the technical Press given by many of the leading engineers, that they are not aware that switches of this type for use with alternate-current motors have been on the market for the past 18 months, and that, furthermore, a great number have been installed in various mills, collieries, &c., more especially in the North ; in fact, in the more recent specifications issued by at least one of the leading firms of consulting engineers in Manchester, this type of switch is specified.

We have made a speciality of the manufacture of these for the past 18 months, and have supplied switches for controlling over 17,000 H.P. of three-phase motors, and have on order at the present time switches for controlling an additional 5,500 H.P.

We enclose a copy of our catalogue relating to these switches, from which you will see that we are manufacturing them in four standard sizes for 15, 50, 200 and 500 amperes per phase, suitable for mounting on switch panels, or we supply them fitted in protected iron cases, or in gas and water-tight cases as required.

From the prices given you will see that the cost of installing switches having this no-voltage feature is not very much in excess of that of installing ordinary high-class cast-iron case switches.

Furthermore, as these switches are of the remote control

type operated by a separate small switch, the main switch can be mounted close to the motor which it controls, the operating switch being placed in any convenient position. This frequently leads to a considerable saving in the cost of the three-core connecting cables, and in certain instances we have been able to show that it was cheaper to fit switches of our no-voltage release type instead of switches of the ordinary ironclad pattern.

In addition there is the advantage that all our switches are of the oil-break type, with quick make-and-break action.

We must apologise for taking up so much of your space with this letter, but we think that in view of the evidence which was given at the afore-mentioned inquiry this matter is of interest to the majority of electrical engineers in this country.

Eckstein, Heap & Co.

Salford, *March 17th*, 1908.

LEGAL.

Postmaster-General *v.* National Telephone Co.

This case was briefly mentioned in our last issue. Sir Robert Finlay, K.C., Mr. Danckwerts, K.C., and Mr. H. H. Gaine appeared for the appellants, and the Attorney-General, the Solicitor-General, and Mr. Casserby for the Crown.

Sir Robert Finlay, K.C., in opening the appeal, stated that the question raised related to the scope of the exemptions contained in the Act relating to the transfer of the telegraphs to the Postmaster-General, and the monopoly thereby conferred upon him. Put shortly, the point was whether, as Mr. Justice Swinfen Eady decided, the "exception" was confined to the case of telegraphs connecting different parts of the establishment of the same person. That was to say, whether the only exception from the monopoly of the Postmaster-General was the case of telegraphs connecting a man's house with his stables, or the connecting two offices which the same merchant had.

Lord Justice Moulton: What is the distinction between the two?

Sir Robert Finlay said that it was very difficult to see any distinction. If the exception was confined to the case where a man was sending a message to himself or his employés at another place, then the provision that no charge was to be made for sending the message was totally meaningless. No man ever charged himself for sending a message to his stables from his house, or from his house to his office in London. What Mr. Justice Swinfen Eady had held was that although the wires were established for the use and convenience of a particular merchant or firm, yet if those who communicated with the owners at the other end were independent persons and not in the "owner's" service, the exemption did not apply. If the view of the Crown were right, it would bring in the electric door bell, and if any person who thought he had business with the proprietor of the house, but whom the proprietor did not wish to see, touched the button, the privilege of the Postmaster-General was infringed. He contended that the provision stating that "no charge was to be made" showed that it was never contemplated that "private wires" should be confined to connecting different parts of the premises of the same occupier.

Mr. Danckwerts followed on the same side.

In reply to a question by the Court, Sir Robert Finlay said he would admit that if in the case of theatrical agents the apparatus were used for the purpose of putting the hotel people in communication direct with the theatre, that would not be covered by the exception.

The Attorney-General supported the judgment of Mr. Justice Swinfen Eady. He said there might be 150 lines, and in such a case it would always be possible by some simple mechanical contrivance to put 150 persons in communication with each other on the private lines. That illustration showed the importance of constructing the word "private" strictly in accordance with the intention of the Act. He contended that these private wires must be used strictly for the private business of the lessee. To bring the wire within the exception, the dominant factor was that the line was to be for the private use of the lessee. The moment they got the line used for the private use of two or more persons, they got outside the exception.

Lord Justice Buckley said he understood the learned counsel's argument to be that if he telephoned to his servant to send him a pair of boots, that came within the exception; but if he telephoned to his bootmaker to make him a pair of boots, that did not come within the exception.

The Attorney-General said that was his contention. He submitted that the moment they got outside the private use into business use they got outside the privacy contemplated by the section.

The Master of the Rolls asked Sir Robert Finlay what he would say if the Court held that the proper construction of the licence was such as to make the company liable for royalties, whether the instances given fell or did not fall within the exceptions.

Sir Robert Finlay said that the Crown had never taken that point before. He wished to know whether they now took it.

The Attorney-General: The Crown take anything.

In the result, their Lordships allowed Sir Robert Finlay an adjournment in order that he might consider the position.

Dundee Tramway Cases.

The record has been closed in the Sheriff Court in an action against the Dundee Corporation by a widow, who claims £300 as solatium for the death of her daughter, who was knocked down and killed by a tramcar. It is alleged that the car was driven recklessly, and this is denied. Another case in which a woman sued for damages for injuries sustained through being knocked down by a car has been settled.

Before Sheriff Campbell Smith, on Wednesday last week, Duncan McCulloch, electric tramcar driver, was charged with having recklessly driven a tramcar and caused it to collide with a horse and cart, whereby the carter was thrown from his seat and seriously injured. McCulloch pleaded not guilty, and evidence was led at great length, after which the charge was found not proved.

Williams & Sons *v.* Beckenham U.D.C.

On Friday, in the King's Bench Division, Mr. Justice Darling and a special jury had before them this case, in which plaintiffs sought to recover the sum of £750, the balance of an account for goods sold and delivered, and the hire of generating sets for six months from October, 1906, to April, 1907, at £125 a month. Defendants had an option to purchase, but did not exercise that option. Defendants said that the machinery did not produce the electricity necessary for the defendants' purposes, and they counter-claimed for £417. Ultimately the case was settled, a verdict being entered for the plaintiffs, for £500 and costs.

Snow Nuisance.—Liability of Tramway Undertakers.

At the Brentford County Court on Friday, before his Honour Judge Howland Roberts, the Acton District Council sued the London United Tramways Co. for £25, the cost of labour incurred in clearing snow from the Uxbridge main road through Acton.

Mr. Nalder appeared for the plaintiffs and Mr. Herbert Neild for the defendants.

The former stated that under the General Tramway Statutes, incorporated in the Tramway Companies' Acts, the tramway company was to keep in a clean and satisfactory condition the tram track and 18 in. on each side of it. The margins of the road were under the control of the plaintiffs, as the urban sanitary authority. Being a main road, it was, by the Local Government Act of 1888, vested in the Middlesex County Council, and by Sec. 11 of that Act, the local authority could agree with the county authority to maintain it and charge the cost to the county. The Acton Council did not avail themselves of this Section, but, by Sub-Sec. 4 of the Section, they agreed with the County Council, for the annual payment of £400 for 12 years from 1895, to scavenge and water the road. In the event of having to clear snow, the County Council was to pay such extra sum as the Council incurred over the £400. The Acton District Council had a private Act, under which the tramway company was to be allowed to put snow on the sides of the track, but not in any way to impede traffic, and they were to remove it in a reasonable time. In the event of failure, the local authority would do the work and charge them with the cost. At Christmas, 1906, there was a heavy fall of snow to the depth of about 6 in. The tram company used a kind of snow plough to clear the snow off their track, and this cast it upon the sides of the track, which were maintainable by the District Council. The tramway company, by Sec. 28 of the Tramway Act of 1870, were bound to put snow in a "proper place," but the sides of a main road, along which there was considerable traffic, were not a proper place. The cost to the District Council was £25, and they sued to recover this, and alternatively they asked for damages by reason of a nuisance and obstruction.

Mr. D. J. Ebbetts, surveyor to the plaintiff council, said that the cost of removing the snow was £80 6s. 10d., but only a third was charged against the defendant company, as representing the amount of snow they threw on the haunches of the road.

Cross-examined: No notice was given the company to remove the snow. By the action of the company traffic was impeded, but the road was not made impassable. The Acton Council scavenged the road as the agents of the Middlesex County Council.

Mr. Neild, in defence, submitted that there was no liability on the part of the tramway company to remove the snow. Under the General Tramway Act of 1870 all the company was bound to do was to "maintain and keep the track in good condition and repair." That had no reference to removing snow, but had regard only to actual works of renewal to the surface of the road, and not to works of scavenging. There was no question of safety of the public here, and no impassability of the road, because the snow was only 5 or 6 in. deep, and there was the clear tramway track for the use of vehicles or pedestrians. Further, this road was still vested in the Middlesex County Council, who did works of repair and maintenance, all the local authority did being to scavenge and light for £400 a year, with extra payments of moneys spent over that sum for snow removal. That clearly showed that the

County Council regarded scavenging as their duty, and therefore they should have been plaintiffs here.

His Honour pointed out that this was not a claim for clearing the tram track, but for clearing something the tramway company threw on to the road over which the District Council took control.

Mr. Neild rejoined that the District Council should have charged the County Council with the amount spent on the work, and the County Council should have sued the tramway company. With respect to the question of nuisance, that was governed by the Public Health Act, under which notice must be given to the company before the work was undertaken by the District Council. Moreover, penalties for a nuisance must be sought before the justices and not in a civil court.

Mr. Nalder, replying, said that the Acton Council, under their agreement, acted as agents for the County Council. What they did was to remove something which the tramway company improperly cast on their road, because by statute it should be put in a "proper place."

His Honour reserved judgment.

Norwich Corporation *v.* The Norwich Electric Tramways Co., Ltd.

This case came before the Court of Appeal, consisting of the Lord Chief Justice and Lords Justices Farwell and Kennedy, on Friday, on the appeal of the Tramways Co. from a judgment of Mr. Justice Bray in favour of the Corporation.

Mr. C. A. Russell, K.C., Mr. Danckwerts, K.C., Mr. Boydell Houghton appeared for the appellants, and Mr. MacMorran, K.C., and Mr. Wild for the respondents.

Mr. Russell said that the appeal was brought for the purpose of determining the rights of parties who disagreed as to the extent of their liabilities as to the repair of the streets through which the company's tramways passed. The case first came before Mr. Justice Phillimore, who decided the case in favour of the Corporation, but the company then raised the point that the General Tramways Act provided for settlement or dispute by arbitration before an Official Referee appointed by the Board of Trade, and in consequence the question was referred to the Hon. Alfred Lyttleton, who made an award in favour of the Corporation for a sum of £320, with an addition of 5 per cent. and costs of the arbitration, holding that under the Electric Tramways Act, 1897, the company were bound to keep the junction between the granite setts on which the line was laid, and the road which was maintainable by the Corporation, in a proper state of repair, and if they failed to do so the Corporation were entitled to do the work themselves, after giving statutory notice to the company, and to reserve a reasonable sum therefor. The Divisional Court upheld that award. The learned counsel contended that the Divisional Court were wrong on the ground that the company were only bound to maintain and repair the part of the roads upon which the tramline ran.

In the result the appeal was dismissed with costs.

The South London Electric Supply Corporation, Ltd.

In the Chancery Divison of the High Court of Justice on March 14th, Mr. Justice Neville had before him a petition for the reduction of the capital of this company. Mr. Gatey said the petition was for the reduction of the capital of the company from 65,000 £5 shares to a like number of £4 shares; in other words, knocking £1 off each share, on the ground of loss of capital. The company was incorporated in December, 1876, and its objects were to purchase the Lambeth Electric Lighting Order and carry out certain contracts for electric lighting. One of the objects over which there had been considerable loss was the erection of a dust destructor. This involved the company in heavy legal proceedings, which resulted in the destructor work having been put an end to. Mr. Justice Neville sanctioned the reduction.

John Hall *v.* Paisley District Tramways Co.

At the Sheriff Court, Paisley, on March 12th, the Sheriff Substitute having considered the proof, productions and process, and having heard parties' prors, found as follows, according to a report which has been sent to us:—

1. That while the pursuer was engaged on October 14th, 1907, at the works of the defenders at Elderslie in hammering with a sledge hammer a cold set which was being held in position against a portion of a tramway rail in course of being cut through by Mr. James Morton, permanent way superintendent of the defenders' company, a small splinter accidentally flew from the said rail into the pursuer's mouth, causing a slight injury to the tongue.

2. That the said injury in no way incapacitated the pursuer for work, and was completely healed by October 15th, 1907, the day following. Finds in fact and law that there was no negligence on the part of the defenders or any one for whom they are responsible which caused or contributed to the said accidental injury. Therefore assoilzies the defenders, and finds them entitled to expenses, remits the account thereof when lodged to the Auditor of Court to tax and report, and decerns.

It was added that the action should never have been brought. The alleged serious injury to the pursuer was absolutely negatived by the evidence of Drs. Swan and Russell. "The occurrence was in itself a pure accident. There would have been no negligence in Mr. Morton ordering the pursuer to use the sledge hammer, even if it had not been proved that he gave that order. As a matter of fact, the Pursuer was using the sledge hammer before Mr. Morton came on the scene. That was the proper way to do the work. It appears to me that a claim under the Employers' Liability Act or at Common Law would have been hopeless even if the pursuer had been hurt. Nor is there any claim under the Workmen's Compensation Act. as the pursuer was only incapacitated, if at all, for an hour or two."

Neal *v.* South Metropolitan Electric Lighting & Tramways Co. Ltd.

In the King's Bench Court last week this case was heard. It was an action to recover compensation for injuries suffered by the plaintiff, Charles Neal, a plasterer, in the employ of the L.C.C., through the overturning of one of the defendants' cars at Carshalton, on Easter Monday. Plaintiff said that up to April last year he was employed as a plasterer by the L.C.C. at the Banstead Asylum. On the day in question he went with one of his children from Sutton to Croydon on an electric tramcar, and on the return journey they were riding on the top. There was a sharp turn at Ruskin Road, Carshalton, towards which there was a decline. When the accident happened Neal and his child were thrown into the road and rendered insensible. Neal was cut and bruised and one of his knees was seriously injured. He was detained in the hospital for a considerable time, and had not been able to use his leg properly since the accident. On full time his earnings would be £2 4s. a week, and since the accident he had not been able to earn anything.

A verdict was given for the plaintiff with £800 damages.

Sayer *v.* South Metropolitan Electric Lighting and Tramways Co., Ltd.

In the King's Bench Division of the High Court on Monday, in a case which was heard by Mr. Justice Lawrance and a special jury, a sum of £360 was awarded Mr. Henry James Sayer, a coachbuilder of Sutton, and his wife and child, in an action brought by them against defendants for injuries and loss incurred by the reason of the overturning of one of the company's cars at Carshalton on Easter Monday last. The only question for the jury was that of damages, and the sum awarded was apportioned as follows:—Mr. Sayer £300, his wife £50, and the child £10.

Halifax Tramway Claim.

At the West Riding Assizes, before Mr. Justice Channell last week, Hiram Pickles, a compositor, aged 63, sued the Halifax Corporation for £785 damages for personal injuries sustained by him while attempting to enter one of the Corporation's tramcars. Plaintiff said that he got on to the lower step and caught hold of the upright when the car suddenly jerked forward. He was dragged some distance along the road, his knee was fractured and he was ill for six weeks. The injuries were said to be permanent, and to partially disable him from following his occupation as a compositor. He claimed £74 for loss of wages, £50 for medical expenses, £50 for personal suffering, and the balance as compensation for decreased earning capacity. It was alleged for the defence that plaintiff was partly to blame, as he did not get on to the car at a stopping place, but endeavoured to stop it on an incline. Before the driver could pull the car up plaintiff attempted to jump on, but he slipped and fell.

The jury found for plaintiff, and awarded £275 damages.

Blackpool and Fleetwood Tramroads Co. *v.* Fleetwood U.D.C.

The hearing of this case, which was brought for the recovery of the sum of £530, in respect of the general and special improvement rate, has been adjourned *sine die*.

Electricity in Lancashire.—If what we hear be true, and there is no reason to doubt it, makers of electrical plant will shortly be favoured with gratifying orders from many important industrial centres in Lancashire. A score or more of powerful and wealthy cotton spinning and weaving, paper-making, bleaching, colliery and engineering firms in Manchester, Oldham, Ashton, Bolton, Bury and Wigan districts are having electrical plant installed during the coming spring and summer months, for driving and other purposes.

BUSINESS NOTES.

Ventilating Underground Cable Boxes.—Messrs. Bullers, Ltd., of Tipton, London and Hanley, gave a demonstration at their Tipton works on Wednesday last week of a new patent ventilated junction-box for underground cables, which they, in conjunction with Mr. E. J. Chambers, M.I.Mech.E., one of their directors, have brought out. A distinguished company witnessed the experiments, including Major O'Meara, C.M.G., chief engineer to the Post Office, Sir John Gavey, C.B., consulting engineer to the Post Office, Mr. Foulger, engineer to the Gas Light and Coke Co., Mr. Crabb, of the South Metropolitan Gas Co, Mr. Salt, of the Bradford Corporation, &c.

The new box is ventilated by partitioning off the opposite corners of the box, allowing the gas to escape through holes covered with wire gauze in the partition, and thence up through perforated lids, which are hinged to admit of ready access for cleaning purposes. A special design of the underside of the lid prevents the accumulation of gas in the top part of the box, and induces the gas to pass out through the orifices provided. To demonstrate the ventilating capacity of the new box, three of the type of boxes at present used by the Post Office, and three of the new boxes, were sunk in the ground as in actual practice, and connected by 3-in. cable pipes having rods in them to represent cables. Gas was then turned on and allowed to leak into both sets of boxes at the rate of 4 cb. ft. per hour for five minutes; without turning the gas off, the mixture was fired by means of an electric spark in one of the P.M.G. type of boxes, a considerable explosion took place, and the flame passing along the pipes fired the other two boxes, lifting the lids off, and displacing the brickwork round them. The spark was then applied to the ventilated boxes, first in the vent chambers, and then in the main box; no explosion whatever occurred. Gas was then turned into the ventilated boxes at the rate of about 40 cb. ft. per hour for five minutes, but no explosion occurred, the gas simply lighting. A further experiment was tried of stopping up the perforation in the lid of the vent chambers with mud, and letting the gas leak in as before at the rate of 4 cb. ft. per hour for five minutes. The boxes were then "sparked" as in the previous experiments; no explosion occurred, the gas simply lighting and forcing the mud out of the holes without disturbing the box in the slightest degree.

General satisfaction was expressed with the results of the experiments, and the visit was brought to an interesting conclusion by a look round the various shops of Messrs. Bullers' Tipton factory. The firm hold a unique position, as besides being the largest makers of porcelain and metal work for telegraph and telephone line material in England, they are the only firm who manufacture both insulators and ironwork in their own factories.

Names Wanted.—The Trade Information Bureau of the Automobile Co-operative Association has received an inquiry for names of firms who make polished walnut, oak and teak cases by machinery. These cases are specially required for accumulator and portable hand-lamp work. Information should be addressed to Mr. J. B. King, manager, Motor Trade Information Bureau, A.C.A., Ltd., 1, Albemarle Street, Piccadilly, London, W.

Notices Relating to Patents.—Several announcements appearing under this heading in our advertisement pages give particulars of a number of electrical patents in regard to which it is sought to make arrangements for "full development and practical working in this country."

The Waldorf Hotel Installation.—In regard to the article on the electrical installation at the Waldorf Hotel, which appeared on page 400 of our issue of March 6th, we are asked to state that the pushes, indicators, and bells for the bell installation were made by Messrs. D. H. Bonnella & Son, Ltd., to the design and order of the Aberdeen Electrical Engineering Co.

Rumoured American Invasion of Manchester.—One of our correspondents learns from official sources that certain American engineering firms are now negotiating for sites in Trafford Park, Manchester, but their identity is not to be made known at present. "The works used by the American Road Car Co., in Trafford Park, are at present unoccupied. Conjecture is rife as to their future use."

Catalogues and Lists.—Union Electric Co., Ltd., Southwark, S.E.—List No. 1,104, giving particulars and prices of single-phase motors constructed for circuits of 50, 60, 83 and 100 periods, and of size ranges from ¼ H.P. up to 60 H.P. Also list No. 8,009 giving prices of, and very full information concerning, their portable wattmeters and neutral point resistances.

General Electric Co., Ltd., 71, Queen Victoria Street, London, E.C.—The company is just circulating amongst its friends another of its "Whom to Ask For" wall cards with monthly calendar slips. Photographs are given of "heads" of some fifteen departments, sufficiently large and clear for one to know whether one sees the man for whom one asks.

The Wilson-Wolf Engineering Co., Ltd., Thornton Road, Bradford.—Preliminary pocket list of direct-current "Arctic" ventilating fans (12 in. to 48 in. diameter). Prices are shown. A new full catalogue is in course of preparation.

British Prometheus Co., Ltd., Salop Street Works, Highgate, Birmingham.—Circular announcing large reduction in prices for a number of lines of their electric cooking and heating apparatus.

Messrs. Johnson & Phillips, Ltd., Victoria Works, Charlton.—Price sheet, briefly describing and illustrating their voltage transformers for metallic filament lamps. Copies can be obtained by any reader on application.

Messrs. A. P. Lundberg & Sons, 477-487, Liverpool Road, London, N.—Circular showing, describing and stating prices of their "Pivot" switches, with improved mica insulation.

Mr. H. B. Brooks, Granville Works, Tennant Street, Birmingham.—Leaflet No. L20, containing a description with illustrations and table of sizes and prices of continuous-current motors from ⅛ to 16 B.H.P.

Messrs. Geo. Kent, Ltd., 199 to 204a, High Holborn, W.C.—Pamphlet comprising a number of leaflets relating to "Crystopal" wall tiling, which, in addition to a variety of general applications, is being used by engineers for a number of electric power houses in this country and in engine houses, pumping stations, and in sanitary work.

The Davis Electrical Co., 17, Moor Street, London, W.—New catalogue of "Eureka" electrical steel conduits, fittings, and accessories made by Messrs. J. Birch & Sons, Ltd., of Walsall, for whom the Davis Co. are sole agents for London and South and East Coasts. Copies of this price list can be obtained on application.

Messrs. Hedley O. Brown & Co., Victoria Oil Works, Soap House Wharf, Hull.—Circular relating to their "Gearpaco," a production for rendering noiseless the gear of electric tramcars. In addition to adhering well to the cogs, it is claimed to possess the advantage of preserving them.

Trade Announcements.—We are asked to state that Messrs. Hogan & Wardrop are agents for the Thames Iron Works Shipbuilding and Engineering Co., Ltd., for the West of London and the South-east Coast, and that Messrs. Marples, Leach & Co., of 6, Victoria Avenue, Bishopsgate Street Without, E.C., still hold the agency for the East of London, the Midlands, Colonies, &c.

The Howard Asphalt Troughing Co., Ltd., of Trafford Park, have purchased outright the whole of the patents formerly belonging to the Simplified Underground Conductor Co., Ltd. (in liquidation), of 180, Crown Street, Liverpool.

Mr. Cecil Hodges and Mr. Harry Snowdon have dissolved partnership. The former is continuing the business of Cecil Hodges and Co., at Balfour House, Finsbury Pavement, as hitherto. Mr. Hodges asks us to state that he is still and has always been at Balfour House, where all letters and orders for Cecil Hodges & Co. should be sent. Messrs. Cecil Hodges & Co. have works at Red Lion Street, Clerkenwell. Mr. Harry Snowdon will continue his works and business independently at Millwall, and will trade under the style of the Millwall Electric Co. The book debts of the partnership now dissolved will be collected by Mr. Harry Snowdon, at Snowdon's Wharf, Millwall.

Messrs. J. P. Hall & Co., of Oldham, announce that after Friday, 20th inst., Messrs. Loxley & Co., of Leeds, will no longer have any connection with their firm, and they request clients to forward all communications to them direct at Blackriding Iron Works, Oldham.

Messrs. I. Frankenburg & Sons, Ltd., of Greengate Rubber Works, Salford, Manchester, have been elected members of the Cable-Makers' Association. The firm have had about 10 years' experience as cable-makers, and have been established as rubber manufacturers for about 40 years.

Factory Site.—A 4-acre freehold factory site at Rugby is for sale by private treaty. Some particulars appear in our advertisement pages to-day.

Receivers Appointed.—Maxim Electrical Co., Ltd., London, S.W.—Messrs. J. F. Poynter & Grote Stirling advise us that on 12th inst. they were appointed receivers for the debenture-holders. They will carry on the business pending arrangements for the reorganisation of the company's affairs.

Dissolutions and Liquidations. — British Compressed Peat Fuel Co., Ltd.—This company is winding up voluntarily with Mr. S. Craig, 3, East India Avenue, E.C., as liquidator.

United States Power Syndicate, Ltd.—Creditors must send particulars of debts, &c., to the liquidator, Mr. T. E. Shuttleworth, Church Street, Sheffield, by April 18th.

Electric Power Development Co., Ltd.—A meeting is to be held at 21, Ironmonger Lane, E.C., on April 14th to hear an account of the winding up from the liquidator (Mr. G. Bostock).

Knapton, Bagnall & Co., electrical engineers, 95, Lansdowne Road, Old Charlton, Kent.—Messrs. G. A. Knapton and R. I. Bagnall, have dissolved partnership. Mr. Knapton attends to debts.

Sambas Rubber and Gutta-Percha Co., Ltd.—This company is winding up voluntarily, with Mr. J. Torrance, 3 and 4, Fenchurch Street, E.C., as liquidator.

General Electric Co., Ltd.—A meeting is to be held on April 22nd at 69, Queen Victoria Street, E.C., at which Mr. N. Gunz, the liquidator, will give an account of the winding up. This, of course, relates to the old company, which was inaugurated in 1889, and was taken over by the present existing company, when it was formed, in 1900.

Bankruptcy Proceedings.—Albert Dickinson, electrical engineer, Armley and Wortley, Leeds.—A supplemental dividend of 2¼d. in the £ is payable on March 25th. Official Receiver, 24, Bond Street, Leeds.

Book Notices.—"Electric Wave Propagation." Paper read before the Institution of Post Office Electrical Engineers, January 11th, 1907, by J. E. Taylor.

LIGHTING and POWER NOTES.

Aberdeen.—The Electricity Committee has adopted a scheme for supplying electricity to the Deeside district direct from the Ferryhill generating station by means of three high-tension cables laid as far as the city boundary, instead of one; this scheme will cost £6,600.

Aspull.—The Aspull (Lancs.) Electric Lighting Order has now been transferred to the Lancashire Electric Power Co.

Ayr.—The electrical engineer, Mr. R. Marshall, has reported in favour of the expenditure of £6,950 on additional plant for the electricity works, with other outlays in 1909-10, bringing the total to £15,050. He also proposes to extend the area of supply beyond the borough boundary, to include the Burgh of Prestwick and the Alloway district of Ayr parish to the River Doon.

Barking.—A L.G.B. inquiry has been held into the application of the U.D.C. for leave to borrow £2,400 for new works in connection with the electric lighting undertaking.

Bath.—The E.L. Committee recently reported having considered the application of the R.D.C. for an extension of the prov. order for two years, and for powers to transfer to Mr. Schenk or others, and the T.C. decided to lodge objections thereto. It appears that the arrangement with Mr. Schenk for the transfer of the Bath electricity supply undertaking cannot be completed by the end of this month, and therefore the £2,500 deposited will be forfeited to the Corporation.

Belfast.—The Glasgow Electricity Committee, on an application by the Board of Guardians of the Belfast Union, has agreed to allow Mr. W. W. Lackie to advise them as to the alternative schemes which the Board have received for lighting by electricity the Abbey Auxiliary Workhouse at White Abbey.

Bishop Auckland.—The L.G.B. has approved of a scheme of main sewerage and sewage disposal for the Denebeck Valley, which comprises a large portion of the Rural Council's district, including South Church, Auckland Park Colliery, Grangehill, Cockton Hill, Eldon and Eldon Lane. The work consists in the laying of several miles of main outfall sewers, the sewage from which will gravitate to the disposal works situate at South Church, with the exception of the sewage from South Church, which it is proposed to pump by electrically-driven centrifugal pumps to the disposal works. The engineers of the scheme are Messrs. D. Balfour & Son, of London and Newcastle-on-Tyne.

Brighton.—Mr. H. S. Bidwell has held a L.G.B. inquiry into the T.C.'s application for power to borrow £7,000 for the extension of electricity mains.

Burnley.—The profits of the electricity department for the year just closed are about £6,000, instead of £5,000 as estimated; £3,000 goes to the relief of rates. For the coming year the profits are estimated at £4,900, the assessment of the works having been increased from £1,300 to £4,000, which means about £800 in rates alone.

Burslem.—At a special meeting of the T.C. last week, the recommendation of the E.L. Committee that application be made to the L.G.B. for leave to borrow £12,000, for the purpose of carrying out necessary extensions, was adopted.

Buxton.—The U.D.C. has received from the L.G.B. sanction to raise a loan of £965 for E.L. purposes.

Chippenham.—The B. of T. has granted an extension of a year for the carrying out of the E.L. order by the U.D.C.

Continental Notes.—Italy.—The Volta Electric Lighting Co., Como, held their annual meeting recently and secured a necessary two-thirds majority to increase the capital of the company from £100,000 sterling to double that amount.

Switzerland.—The central stations of Beznau and of Loutsch, erected by the Motor Co., are in future to be merged into a big undertaking which will control the electrical distribution over a large part of the east and centre of Switzerland. The concession for Beznau on the River Aar is for a period of 100 years, with, however, certain purchasing rights on behalf of the State at the end of 66 years; the Loutsch concession provides for repurchase at the end of 50 years. The works are provided with abundant reservoir capacity to store large quantities of water, and can, consequently, be relied on to cope with large demands when needed. The two installations together will be capable of developing upwards of 16,000 kw. with the water power, whilst at Beznau there is a steam turbine reserve plant of 4,900 kw. capacity. The latter station alone has supplied during the last nine months 43,639,000 units. The network connected to the two stations, which will henceforth be worked in parallel, is 717 km., and the cost will be £1,200,000. This gives a cost complete over the whole installation, including the network, of about £73 per kw. installed. It is intended shortly to make a debenture issue of £300,000 for further extensions.

Dover.—The Corporation is extending the electric mains with a view to introducing the electric light into parts of the town not now supplied.

Fareham.—The U.D.C. on Friday decided to apply for a loan of £10,000 for the erection of a new generating station and generating plant of 185 kw.

Folkestone.—The Rifle Club formed in connection with the electricity works has had a very successful year; it possesses ranges of 25, 50 and 100 yards, and includes many residents of the town amongst its members.

Frome.—Last week Mr. W. Ross Hooper, an inspector of the L.G.B., investigated an application by the U.D.C. for sanction to borrow a further sum of £11,100 for the purpose of the electric light undertaking. The Council was represented by the clerk and the consulting engineer, Mr. C. E. Lloyd (of Messrs. Medhurst and Lloyd), and the contractors, Edmundsons, Ltd., were represented by Mr J. Wigham, their chief engineer. The Inspector commented on the financial position of the undertaking. During the last year it earned 7½ per cent. on what was really capital expenditure, and of that the contractors had to repay 6¼ per cent. principal and interest on loan, which left them with 1¼ per cent. for working expenses and profit. The capital, so far as the Council was concerned, had mounted up to nearly £45,000, and the borrowing powers were approaching a limit. The Inspector, after going into every detail of expenditure from the beginning of the undertaking, adjourned the inquiry until March 31st.

Glasgow.—A Sub-Committee of the Electricity Committee has considered the expediency of putting down additional generating plant to meet the demand for electricity during the winter of 1908-9, and recommends that one additional 4,000-kw. steam turbo-alternator, with the necessary boilers and accessories, be put down in each of the Port-Dundas and St. Andrew's Cross Stations.

The Electricity Committee has decided to purchase a plot of ground extending to 2,050 sq. yards, for the purpose of erecting a transforming station, from which it is proposed to supply the districts of Craigton, Dumbreck, Crossmyloof and Pollokshaws.

Greenock.—From a report by Mr. Robertson, chief engineer to the Corporation, it appears that there are private electrical installations in Port Glasgow amounting to 7,000 h.p. He is of opinion that a genuine demand for electricity for power purposes exists in Port Glasgow, and that a public supply at the same rates as in Greenock would be taken up in such a way as to ensure a financial success.

Heywood.—The T.C. has applied for a loan of £900 for electricity purposes.

Lancashire.—Apprehensive that the passing of a Mines Eight Hours Bill will materially increase the cost of coal, various electricity committees in Lancashire are urging upon the respective councils under which they serve the advisability of opposing the measure.

Leicester.—At Monday's meeting of the T.C., the Gas and Electric Lighting Committee reported that for the half-year ending December 31st, there was a profit of £2,014 on the electric lighting undertaking, after interest on capital, and £3,344 on account of sinking fund, had been met. The profit for the previous half-year was £2,603, making the total profit for the year £4,617. There was a net profit on the working of the department for the past eight years of £788 16s. 2d., after certain items of expenditure had been defrayed out of the accumulated profits.

Liverpool.—The subject of the turbines in the Lister Drive generating station is still much to the fore. On Wednesday last week, at a meeting of the Liverpool City Council, a request was made by Mr. Skelton to be allowed to see the whole of the correspondence which had taken place between the Corporation and the Westinghouse Co. relative to the turbines the company had supplied to the Lister Drive station. Sir Chas. Petrie moved a recommendation of the Tramways and Electricity Committee declining the request, and the Deputy Town Clerk explained that Mr. Bromley Holmes, the consulting electrical engineer, was appointed the arbitrator to settle any dispute between the Westinghouse Co. and the Corporation, and much of the correspondence passing between them had been in that capacity. After further discussion, the motion to refuse the request to show the correspondence was carried by a large majority.

London.—Poplar.—The engineer recently reported that the present plant had been loaded up to danger zone during this winter, and that it would be necessary to provide for an increase of not less than 400 kw. to meet next winter's maximum load. The Electricity Committee had negotiated with several supply companies for a bulk supply, but on the most favourable terms offered, the cost would be far in excess of that at which the energy could be obtained by an extension of the Council's own generating plant, space for which was available in the existing buildings. The engineer's proposal is to replace an existing 200-kw. generating set with a 1,000-kw. turbo-generator capable of developing a 20 per cent. overload, and to provide an additional boiler. This would complete the equipment of the present station, and any further extensions required would necessitate an extension of the buildings. The installation now proposed, with the steam afforded by the new dust destructor, is expected to render further extensions of the generating plant unnecessary for at least three years. Capital expenditure must also be incurred for distributing plant, including new feeders, additional sub-station and sub-station plant. The engineer estimates that the cost of the generating and distributing extensions now proposed will be about £27,200. The Council has provisionally approved the

extensions indicated, and authorised the Committee to obtain tenders from selected firms for the types of plant required. The Electricity Committee, in view of the present low price of copper and the probability of an early advance, has authorised the engineer to enter into an arrangement with the Western Electric Co., who submitted the lowest quotation in competition with other companies, for the purchase by the company of 30 tons of copper to be made up into cable as required by the Council in the next two years, at a fixed schedule of prices. The Council has recently approved this course.

A joint committee of the Works and Electricity Committees reported as to the installation of a new refuse destructor capable of supplying steam to the electricity undertaking. The Committee agreed upon a scheme put forward by the Horsfall Destructor Co., of which the capital cost would be £17,700. The amount of loan on present destructor required to be paid off is £3,694. The annual cost was estimated at £5,345. Last year the disposal of refuse cost £5,293, but under the proposed scheme the receipts from by-products would be £3,608, reducing the net annual cost (on an average of the last three years) to £1,908. The Committee's proposals were referred to the Finance Committee.

Marylebone.—The B.C. Electric Supply Committee reports that anticipations as to the diminution in the gross revenue for the year have been realised, the average yield per unit sold to private consumers for the six months ending in December (including meter rentals) being 4·42d. The average estimated last March was 4·65d. This diminution is brought about by the large proportion of new business at the cheaper rates of supply, *i.e.*, power and heating purposes, basement and sign lighting; and the more profitable among the old consumers have elected to be charged on the maximum demand rates adopted by the Council, which give a low average price in proportion to the number of hours of burning in each individual case. The working costs for the six months are at a higher rate than the Committee estimated for the complete year, owing largely to the increased price of coal and abnormal repairs, both at the works and on the distributing system. There was a special renewal charge of £1,734 in respect of the cost of rendering effective for their present work the accumulators at a sub-station, purchased from the company, and not included in the year's estimates. The management costs have been steadily reduced, and during the six months work out at ·248d., against ·270d. estimated for the year. The repairs charges have been considerably reduced during the current quarter, and this, together with further economies effected in the standing charges, should result in a more favourable return for the March quarter. For the reasons named, the complete year's accounts may show a small deficit. The credit balance in hand at March last amounted to £29,325, of which £7,000 has been set aside to a special contingency fund, leaving £22,325 for carry-over and depreciation. The question of more economical costs of production is receiving the Committee's careful attention, and the consulting engineer is advising it on this, as well as on the revision of the tariff of charges to consumers. The Committee realises the necessity for adopting active measures tending to a large increase in sales, in order to spread the very heavy standing charges over a larger number of consumers.

At the meeting of the L.C.C. on Tuesday some discussion took place on a report by the Finance Committee respecting an application made by the St. Marylebone B.C. for the advance of £9,172 for mains, machinery, pump and motor, switchboards, &c. In addition to that sum the Borough Council had applied for £44,000 for electric lighting works, but the Committee was not yet in a position to report on the second application. The two amounts added to the sums already sanctioned would bring the total loans in respect of the undertaking up to £2,043,000. When the last application was under consideration the Committee informed the Borough Council that in view of the large expenditure on the enterprise, it would feel great difficulty in recommending the sanction of any further loans, and that only loans which were absolutely necessary would be considered. The Borough Council had been reminded of that communication, and been asked why the two further applications in question were made. In reply the Borough Council stated that the applications related chiefly to expenditure in connection with the change of pressure and system of supply, and to the balance of the cost of erecting the generating station. When the change of pressure was embarked upon it had to be completed; it was impossible in the early days to estimate closely the probable cost, and the work had to be carried through in a limited time, and involved greater expenditure than was expected, owing to the stringent regulations made by the Board of Trade and the County Council. The Borough Council added that the applications covered the expenditure to date, and that it was not contemplated that any additional outlay on generating plant would be necessary in the normal development of the undertaking for some years to come. After discussion the loan of £9,172 was sanctioned, leaving the second loan of £44,000 for further consideration.

Hampstead.—The B.C., in order to meet the increasing demand, has decided that a new sub-station be constructed and 360 yd. of feeder be laid in connection therewith, at an estimated cost of £380.

Bermondsey.—The electrical engineer has reported to the Electricity and Street Lighting Committee that the engine room at the generating station has space available for two steam dynamos of 750 kw. capacity each. His estimate for the required extensions is as follows:—One steam dynamo, 750-kw., £5,810; one marine boiler, £1,900; condenser, £3,460; total, £11,170. The present plant capacity is 1,475 kw., and the highest load observed was 1,055 kw. In the event of the 500-kw. steam dynamo breaking down there would only be available plant to the extent of 975 kw.

In a report made by the borough treasurer it is pointed out that the income for the year ending March 31st next will be £18,500, and the estimated surplus £800. The Committee has decided that the work shall be put in hand with the least possible delay.

Greenwich.—The Rating and Adoptive Acts Committee has resolved with regard to the question of moving for a mandamus against the Greenwich Assessment Committee, that the town clerk be authorised not to act upon the instructions which were first given to him, but to include the property in a supplemental list, in the hope that litigation may be avoided.

Shoreditch.—The L.C.C. has resolved to sanction the borrowing of £7,150 by the Shoreditch B.C. for mains, meters and house services.

Haggerston Baths are to be re-wired at an estimated cost of £76; and in the working-class dwellings, 106 pre-payment electricity meters are to be installed, at an estimated cost of £225.

St. Pancras.—For the purpose of maintaining the pressure of supply in one locality, the Electricity and Lighting Committee proposes to link up the mains at an estimated cost of £45. Among the applications for supply reported is one for a 5-ampere chicken incubator.

Westminster.—An application of the Westminster Electric Supply Corporation to lay mains and construct boxes in four thoroughfares has been granted, subject to the work being completed before May 1st next, and to the proposed boxes being ventilated by combined ventilating covers instead of by separate gratings. The Works Committee has resolved that a protest be made against the L.C.C. exercising jurisdiction in connection with the laying of underground telephone wires by the National Telephone Co. in any street in the city, or imposing upon the company any conditions with reference to matters which are within the jurisdiction of the City Council as road authority. The Works Committee points out that the power given to the County Council by the Telegraph Act, 1892, does not override the power of the road authority, but is supplemental to it.

Stepney.—The B. of T. having consented to the adoption of a 6,000-volt transmission from the proposed generating station at Blyth's Wharf, tenders are to be invited for the erection of the station.

Neston.—Messrs. Fenwood & Williams have informed the U.D.C. that the owners of the Hinderton Estate intend to provide an E.L. supply by next Christmas, and have asked if the Council would be prepared to take a supply of electricity for public lighting, on a prov. order being applied for. The Council has decided to obtain further particulars of the scheme, together with the terms of a suggested agreement.

Oldbury.—Subject to the approval of the B. of T., the U.D.C. intends to transfer its E.L. Order, 1898, to the Shropshire, Worcestershire and Staffordshire Electric Power Co., for 42 years, from August 12th, 1902, the consideration being £800.

Penzance.—As the result of a letter from Mr. J. V. Thomas, on the subject of the prospects of his company obtaining funds to work the Penzance Electric Lighting Order, which expired on August 15th, 1906, the Council has resolved to take no action towards its revocation until October 31st next.

Perth.—The Caledonian, North British and Highland Railway Companies have agreed to the proposal of the Electricity Committee to increase the special rates for their hotel, yards, &c., for the current year to 2¾d. per unit.

Radcliffe.—The U.D.C. has decided to supply energy for power to the East Lancashire Paper Mill Co., Ltd., from Saturday at 2 p.m. until Monday at 6 a.m. at 1d. per unit net.

Sandown.—At a meeting of ratepayers on March 11th, it was decided by 165 votes to 57, to request the U.D.C. to continue the lighting of the town by electricity, and not to revert to gas lighting.

South Africa.—Germiston (Transvaal).—At a meeting of the T.C. on February 13th a lengthy discussion took place on the tramway and lighting scheme, which, as already stated, is estimated to cost £30,000, in which is included £5,000 for possible extensions; it was decided to get the advice of the Government Electrical Engineer, failing which the sum of £250 is to be spent on expert advice on the whole scheme.

Randfontein (Transvaal).—The new power scheme in connection with the electrification of the Randfontein Estates group of mines is now well in hand, a start having been made in the laying of the cables connecting the various mines, and it is also hoped to supply private consumers in Randfontein village.

Durban.—A canvass is to be made to ascertain how many additional private consumers can be obtained if the price be reduced from 8d. to 6d. per unit.

Southend.—An inquiry has been held by Mr. H. R. Hooper, L.G.B. inspector, into the application of the T.C. for leave to borrow £26,690 for the purposes of the electricity undertaking. A sum of £5,750 was included for the purchase of land and houses, in respect of which a claim against the generating station for damages for nuisance had been advanced; and a sum of £8,706 for plant, which it is proposed to purchase next September, most of the remainder being devoted to condensing plant.

Widnes.—The B. of T. has informed the T.C. that consideration of the revocation of the E.L. order, 1901, will be deferred until the end of 1908.

Wishaw.—Mr. Patchell has been appointed arbiter in the dispute between the T.C. and the Clyde Valley Electric Co.

It is anticipated that there will be a deficit of some £800 on the electricity undertaking by the end of the financial year.

Wolverhampton.—Recently important extensions have been made to the plant at the Corporation electricity works, and the completion of the works was signalised on Monday evening, when, on the invitation of the Chairman of the Electricity Committee (Councillor Gough Allen) and his colleagues, a numerous company assembled to witness the start of the new machinery. The nature of the extensions may be gathered from the fact that the boiler house and engine house have been increased in size by no less than 58 ft., and a new steel chimney has been erected. Two turbo-generators, with corresponding boilers, have been introduced, owing to a greater demand for electricity, principally for commercial purposes, in the borough. The old plant consists of direct-current generators driven by reciprocating engines. The boilers are of the water-tube type. A number of new features have been introduced to effect economy; and as an example it may be mentioned that the Rees Roturbo pump will give the same service as the three steam pumps which it replaces. This is the first time, it is stated, in the history of engineering that this type of pump has been applied to boiler feeding. Further particulars of the plant appear elsewhere in this issue. The Mayor of the borough and the Chairman of the Committee, who were presented with handsome souvenir keys, set the machinery in motion; and subsequently several toasts were proposed. Mr. C. E. C. Shawfield, the electrical engineer, in replying for "The Engineer and Staff," said there had been a boom in power supply. Several local firms had considered the question of electrical driving, amongst them being Messrs. Bayliss, Jones & Bayliss; and other firms in the near future would become customers of the Corporation for a considerable amount of power. He, therefore, had advised the T.C. to put down this installation. It was hoped that many large works would be attracted to the town, and one of the greatest inducements it was possible to offer any firm was the supply of cheap motive power. While cheap power was absolutely necessary, if they sold at the lowest possible price, they could not expect the largest possible profits. He had no fear but that the price would be sufficient to cover working expenses, adequate depreciation of plant, repayment of capital and interest, and leave a margin besides.

Yeovil.—Replying to the B. of T., which asked what steps were contemplated by the T.C. to carry out its obligations under the E.L. Order, 1903, the T.C. has decided to inform the Board that it considers it advisable not to take any further action in the matter.

TRAMWAY and RAILWAY NOTES.

Bath.—The Bath Electric Tramways Co. propose making an application to the B. of T. for authority to increase the charges on the western section of their lines. The service is said to be unremunerative owing to the low fares, and those using workmen's tickets travel nearly five miles for a penny.

Bradford.—The Committee has approved plans for the erection of a new brick car-shed in place of the present wooden car-shed at Bankfoot, and for other alterations, at an estimated cost of £3,560.

In order to cope with the requirements of the Education Canteen Sub-Committee, in regard to the conveyance of meals, it is proposed to purchase an additional motor lorry of 3 tons capacity.

The Corporation intends spending about £21,000 on renewals and repairs of track during this year.

Burnley.—The Corporation electrical tramways have made a profit of £10,000 for the past year, and this has been placed to the reserve and depreciation funds. This good result is due, principally, to an increased revenue of £2,000, and a decreased working expenditure of about £1,500.

Ealing.—A report on the proposed municipal tramways is to be prepared by the borough surveyor and the electrical engineer.

East Ham.—The North Metropolitan Tramway Co. has accepted the Council's offer for the acquisition of the section of track in Romford Road. The borough engineer and the engineer and manager were directed to prepare plans and estimates for the construction of the track and overhead equipment along this section of road, and a report is to be presented on the question of inter-running with West Ham along the Romford Road.

Halifax.—The T.C. held a special meeting on Wednesday last week to consider the proposed expenditure on the electric tramway system. After a long debate the scheme was dealt with in sections, some of which were rejected and some conceded; the whole of the reforms sanctioned were estimated to cost £8,000. It is anticipated that there will be a deficit at the end of the present and of the coming year in consequence of the proposed outlay.

The expenses of the Pyenest tramcar disaster, which has cost about £14,000, it is proposed to spread over three years, and surpluses are to be taken from the Gas and Electricity Committees to make up any deficiency. A majority of the T.C., however, suggests that a small increase in the rates, say, from 8s. to 8s. 4d., will be more satisfactory. A special meeting to consider the matter has been called.

Hanwell.—Referring to complaints which have been made as to the state of the tramway track in Hanwell, the London United Tramway Co. has written to the B. of T. that the track is in good order, both as to rails and paving, no expense having been spared by the company to fully maintain its obligation in this connection. The statements of the Hanwell surveyor concerning the condition of the track are described as being grossly exaggerated, and probably inspired by the Council of the adjoining Borough of Ealing; the latter has for several years been endeavouring to force similar unnecessary expense on the company, and two inspections have been made by Col. Yorke, who decided on each occasion that the company was fulfilling its obligation as to maintenance, and that no necessity existed for relaying.

Lanarkshire.—A start has been made with the work of extending the Lanarkshire tramway line from Hamilton to Bothwell and Uddingston.

London.—Deptford.—The Works Committee of the Borough Council calls attention to the abnormal number of openings made by the L.C.C. in that portion of the roads which it is under obligation to repair as tramway authority. The Committee, owing to frequent complaints, caused a record to be kept for three months, and found that in the section of roadway between Deptford Bridge and New Cross Gate there were 23 openings on 22 days. In one street there were 22 openings on 20 days. In another section of the road there were 12 openings on 11 days, and three appeared to have been on the same spot.

City.—The L.C.C. has approached the City Corporation with regard to the running of cars over Southwark Bridge, when it is rebuilt, into the City; but this, it appears, is only a feeler, and the real intention of the Council, as foreshadowed by the *City Press*, is to urge that the tramways be carried on, along Queen Victoria Street, up Farringdon Street, to the present northern terminus, thus providing a real and effective link between North and South, which can never be afforded by the inadequate subway under Kingsway.

Paddington.—The B.C. has agreed to offer no opposition to the Metropolitan Electric Tramway Co.'s Bill, now before Parliament, relating to the extension of their tramways along Harrow Road from Lock Bridge to Edgware Road, the company having agreed to carry out all necessary street widenings at their own cost, to contribute £4,500 towards the expense of the existing improvement at Pickford's Corner, near Bishop's Road Bridge, and to build a new lock bridge.

Greenwich.—The L.C.C. is to be asked to construct a double line of tramway from the present terminus to Church Lane, Charlton, or to Charlton Lane. It is proposed by a joint committee of Greenwich Council that that authority contribute one-third of the cost of the road widenings.

Newcastle-on-Tyne.—At a meeting of the City Guardians on the 13th inst., the chairman of the Assessment Committee said that 18 months ago the Tramways Committee of the Newcastle Corporation appealed against the assessment of the tramway track and equipment and appurtenances. The Assessment Committee arranged that for the time being, there should be an agreed estimate for the tramways of £19,062 and that they should each appoint an independent arbitrator; Sir Francis Blake was appointed umpire. The result was that instead of the Corporation paying upon a rateable value of £19,062, it would now pay on an increased value of £34,756, an increase of £15,694. The effect of that, which had been accepted by both parties, and was binding, was that taking an average of 1s. in the £ for the whole year for the poor rate, the tramways would have to pay £1,738 in the next 12 months, as against £953, an increase of £785.

Oldbury.—Colonel Yorke, on behalf of the B. of T., conducted an inquiry last week into the cause of the recent tramway accident at Tividale, by which the conductor of the car and a passenger lost their lives and nine of the passengers were injured. Frederick Hemming, the driver of the ill-fated car, repeated the evidence he gave before the coroner. R. F. Brown, the engineer to the company, also gave evidence. He stated that the wheels of the cars were supplied by arrangement with the makers, and no tests were made. The pattern was altered six months ago, and he found no fault with it. His first idea was that the car left the rails and collapsed; he now considered that the left-hand rear wheel might have collapsed 9 ft. from the points, and the dropping of this end had caused the right-hand leading end of the car to swing round to the right, and bring the car broadside across the track. The fact that the left-hand side of the car had lost one of its supports would naturally have a tendency to overturn the car.

The witness also stated that there had not been any trouble with the points. The Colonel said he had formed the same opinion as Mr. Brown had formed at the first examination. He did not attach much importance to the expert evidence respecting the slight inequality of the track at the spot. Mr. Brown, in reply to Mr. R. A. Wills (who appeared for the relatives of Mr. Latham, the passenger who was killed), said he had ascertained that an accident occurred at the same place three weeks ago through the fracture of a wheel. The fracture was in exactly the same place as the present one. The Colonel said he had been over the tramway route prior to the inquiry, and he could not attribute the accident to any defect in the permanent way. This concluded the inquiry.

Another death has occurred as the result of the tramway accident on February 20th, James Latham (47), of Wallington Road, Dudley, who was a passenger on the car, having died in the hospital on Monday.

The U.D.C. has signed agreements with the Birmingham and Midland Tramways, Ltd., with respect to the tramways and the transfer of the electric lighting order.

Rotherham.—A curious occurrence on the Tinsley section of the Corporation tramways caused much delay during last week. On Sunday both the Rother and the Don Rivers were flooded. A large barge became stuck under the Bow Bridge, which crosses the Rother just before it enters the Don. The rising water, acting on the barge, caused the displacement of three of the key-stones under the arch of the bridge, and, at the same time, made the pavement between the tramlines bulge several inches higher than the metals. Tramway passengers have to change at the bridge, as cars cannot be got across without danger.

South Shields.—At a meeting of the T.C. on the 16th inst., the question of the position of the manager was again under discussion. A motion was put forward that the resolution passed by the Council on February 11th asking the tramway manager to resign be rescinded, and that the complaints in regard to the management be referred to the Tramways Committee for full inquiry. The Mayor, who is chairman of the Tramways Committee, said there was a complete answer to all the charges made against the manager. After four and a half hours' discussion the motion was lost, and the debate was further adjourned.

TELEGRAPH and TELEPHONE NOTES.

Telegraphic Interruptions and Repairs:—

Cables.		Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra Curacao-Maracaibo	Closed..	Jan. 12, 1906 ..	..
Tarifa-Tangier		Jan. 18, 1904 ..	..
Port Arthur-Chifu (Closed)		Mar. 9, 1904 ..	..
Alexandra-Larnaca		Jan. 28, 1908 ..	..
Tangier-Cadiz		Feb. 10, 1908 ..	March 13.
Paramaribo-Cayenne		Mar. 15, 1908 ..	..
Landlines.			
Puerto-Barrios		Aug. 2, 1902 ..	..

Switzerland.—The receipts from telegraphs and telephones for the year 1906 were £502,880, while the expenses totalled £462,428, leaving a surplus of £40,452 which was greater than 1905 by £23,812. The whole of the balance for 1906 was used towards amortisation of construction capital, which was represented by the sum of £1,385,561. £145,683 was expended in new construction, and as a sum of £135,436 was applied to reducing capital expenditure, the latter was therefore increased during the year by £10,247. Telegraphic traffic increased by 327,803 telegrams to 4,918,679, or over 7 per cent. Inland traffic claimed 1,608,833 telegrams thereof, International traffic 2,339,956 telegrams, and telegrams in transit, 969,885. This resulted in an increase of receipts over the previous year of £11,637. The telephonic traffic also increased, the record of 32,071,177 local and 7,256,198 trunk conversations being in excess of 1905 by 2,180,595, and 676,305 respectively. The total receipts on account of the telephone service were £171,965, or an increase over 1905 of £15,939. The number of subscribers increased from 50,333 in 1905 to 53,711 in 1906.

The telegraph system consisted of 5,888 kilometres of line and 23,058 of wire, the decrease in the former of 146 kilometres, being due to transferences to the telephone service.

The length of submarine cable at 119 kilometres with length of wire 3,260 kilometres, is practically the same as in the previous year. The telephone system claimed 273,162 kilometres of wire, and 16,980 of line. There were 2,283 offices in the telegraph, and 710 central stations in the telephone service. The two systems were worked by 4,170 employés, or an increase of 133 over 1905. During 1906, 769,909 telegrams were exchanged with Germany; 611,120 with France; 281,131 with Italy; 181,401 with Austria; 163,194 with Great Britain; 90,029 with Russia; 52,736 with Belgium; and 27,709 with Holland. 54,819 telegrams were also exchanged with North America; 22,521 with Asia; 19,901 with Africa; and 592 with Australia. 2,759 claims for refund were dealt with, 445 of which were on account of the inland, 311 being recognised, and 130 rejected. Of the 2,147 claims on account of International traffic, 1,862 were allowed and 209 rejected; 167 claims were also filed on account of transit traffic, of which 140 were allowed. The increase in claims over 1905 of 279 is chiefly due to charges on corrections of telegrams in code language. Of the telephone messages, 160,816 were exchanged with Germany, 93,237 with France, and 35,338 with Austria.—*Journal Télégraphique.*

CONTRACTORS' COLUMN.

Openings for New Business.

ABERDARE.—Houses. David Rees, builder, Mill Street, Trecynon.

ABERDEEN.—Alterations to premises in Crown Street for Fraser and Duguid, advocates. Stuart & Murray, builders, Aberdeen.

Additions for A. Livingstone & Co., coopers. D. Hodge, architect, Aberdeen.

Shop in Sunnyside Road, for A. Guild, engineer. J. Milne, architect, Aberdeen.

New recreation pavilion at King's College (£1,000).

ABERDEENSHIRE.—Additions to farm offices at Wester Leys. Jenkins and Marr, C.E. and architects, Aberdeen.

Additions to Aboyne Post Office. G. B. Mitchell, architect, Union Street, Aberdeen.

ALDERSHOT.—Five houses for F. Hooper. Friend & Lloyd, architects, Aldershot.

Houses, High Street, for S. Mitchell.

Alterations and additions to the "Lord Nelson" for Popular Billiards, Ltd., Idol Lane, London. Friend & Lloyd, architects, Aldershot.

ALTRINCHAM (Cheshire). — Proposed infectious diseases hospital. Altrincham Urban Council.

ASHBY-DE-LA-ZOUCH.—Houses and shops, Bath Street, for W. Slater. T Orton, builder, Kilwardby Street.

ASHFORD (Kent).—Houses, Eastern Avenue, for E. Tutt, builder, and offices and showrooms, Wellesley Road, for Lee & Son.

Extensive additions to railway works (S.E. and C. Railway Co.). Martin & Co., builders, Tonbridge.

ASTON MANOR.—Extension of the power station for the T.C. F. W. Richardson, borough surveyor, Connal House, Aston Manor.

BACUP.—New licensed premises at Britannia, for John Baxter, Ltd., Glen Top Brewery, Waterfoot.

BAILIFFE BRIDGE (Near Brighouse).—New village institute.

BANFF.—Academy extension. Mr. Clyne, architect, Aberdeen.

BATLEY (Yorks).—Extensions at Blackburn's mill.

BECKENHAM.—Art school (iron). J. A. Angell, engineer and surveyor to U.D.C.

BERWICK-UPON-TWEED.—New Railway Hotel.

BEVERLEY.—New licensed premises, Holme Church Lane, for Moor and Robson, Ltd., brewers, Hull.

BIRKDALE.—New golf house in Liverpool Road, South. Directors of the Southport and Ainsdale Golf Club.

BIRKENHEAD.—New Central (Carnegie) Library in Chester Street and Market Place South. W. E. Sproat and E. Warwick, architects, 18, Cook Street, Liverpool.

BIRMINGHAM.—Underground conveniences in Hill and Station Streets for the City Council (£3,600).

Alterations and additions to the Queen's Hospital.

BLACKBURN.—Houses, Sapphire Street, for John Riding; Pringle Street, for Joseph McKenna; Cornelian Street, for J. N. and P. Bolton; Holly Street, for the Co-operative Society; Albany Road, for J. J. Winterbottom: Gorse Road, &c., for G. and G. Hodgson; Lambeth Street, for J. Byrom.

New works, Grant Street. J. Highton & Son, builders, Bridgewater Street, Blackburn.

Theatre Royal to be reconstructed for H. Yorke and W. de Frece.

Proposed new spinning mill. New company to be formed.

BLACKPOOL.—Alterations at Derby Arms. H. R. Briggs.

BLAINA (Mon.).—Rebuilding Hope Hall for the Forward Movement. T. Austin, secretary, 18, Glanyrafon Terrace, Blaina.

BLAIRGOWRIE.—New motor garage for Messrs. Crochart.

BOLTON.—Additions to Atlas Mill, Bentinck Street, for the Fine Spinners' Association, Ltd., Manchester.

Additions to business premises for J. Fish.

New school in Local Wolfenden Street, £4,000. Local Educational authority.

BOURNEMOUTH.—New Carnegie library at Springbourne (£2,000).

BRECHIN.—House, garage and offices, Farmer's Mart, Ltd. Mr. Fettes, architect, Brechin.

BRIDGE OF EARN (Perthshire).—New public hall and institute. G. P. K. Young, architect, 42, Tay Street, Perth.

BRISTOL.—Important extensions to the Grammar school for the Governors (£3,000).

Proposed extension to Clifton College. Headmaster.

BUNCRANA (Co. Donegal).—Masonic hall. Mr. Johnston, architect, East Wall, Derry.

BURNLEY.—Proposed new billiard hall. W. Holt, Burnley.

New club premises in Parker Street. Hitchon & Pritchard, architects, 46, Manchester Road, Burnley.

CARDIFF.—Warehouse in Frederick Street, for G. Steer. James & Morgan, architects, Charles Street Chambers, Cardiff.

CARSHALTON.—Shop and house, Bernard Road. A. B. Cook, Cranley House, Wallington, builder.

Development of West Mead Estate. Dartnell & Banks, 34, High Street, Croydon, architects.

CASTLEFORD (Yorks.).—New secondary school in Healdfield Road (£11,000). W. S. Braithwaite, architect, Leeds.

Residence for T. Thompson. R. M. McDowall, architect, Carlton Street, Castleford.

New secondary school. (£11,169). Airey & Sons, builders, Leeds.

CATERHAM.—Houses, Tupwood New Road, for Mr. Luker; War Coppice Road, for Mr. Pertwee.

CHATHAM.—Castle Inn to be rebuilt for Truman, Hanbury, Buxton & Co., Spitalfields Brewery, London.

Villa residence, Mardstone Road, for R. W. Sayer; bungalows, Waldersiade and Robin Hood Lane, for H. W. Brake.

CHESHIRE.—Proposed County Tuberculosis Sanatorium. County architect, Chester.

CHOPWELL (Co. Durham).—New Schools for the C.C. W. H. Bendle, architect, 33, Grainger Street West, Newcastle-on-Tyne.

CLAYTON (Lancs.).—Proposed new Council School. Clerk, Local Education Authority.

CLECKHEATON.—New Wesleyan Schools at Hartshead. E. King, architect, Dewsbury.

COBHAM.—New county residence for G. E. Andrews. A. E. Delve, architect 56, London Road, Strood, Kent.

COVENTRY.—Houses, Earlsdon Lane, for A. Chown; Kensington Road, for G. Blakeman; Westwood Road, for W. Higgins; St. George's Road, for E. Stidworthy; St. Patrick's Road, for Hancox & Co.; St. George's Road, for G. Nicholls; Dean Street, &c., for Brookfield & Stratton; Spencer Avenue, for Hallam & Co.; Clara Street, for C. J. Johnson; Gresham Street, for H. Clarke and Son; Broomfield Road, for C. J. Smith.

Proposed new Children's Homes for the Coventry Board of Guardians.

CRUMPSALL (near Manchester).—New Wesleyan Church. Local trustees.

CUPAR.—School extensions. J. L. Anderson, clerk to School Board.

DARLINGTON.—Houses, Woodland Terrace, for G. Dickinson & Sons; Oak Dean Avenue and Lowson Street, for Kitching & Lee; Cartmell Terrace, for E. W. Lyall; Upper John Street, for J. Jenkins.

DENTON.—Houses, Manchester Road, for Robert Rippingham; and Market Street, for H. Carlisle.

DEWSBURY.—Houses, Highgate Road, for Miss Fearnsides.

DERBY.—Important alterations at Midland Hotel, for the Midland Railway Co.

DORKING.—Proposed new Technical Institute (£5,000). Surrey Education Committee.

DOVER.—Extensions to nursery in Maison Dieu Road. J. Morgan, 55, Church Road, Maxton, Dover.

DUNDEE.—Proposed extension of the Public Baths for the T.C. (£10,000).

Alterations to Royal Orphan Institution.

School at Stobswell. Mr. Langlands, architect to School Board.

DUNFERMLINE.—Extensive alterations to City Arms Hotel.

DURRINGTON (near Worthing).—New school for 250 children. Lionel Thompson, secretary, West Sussex Education Committee, Horsham.

EASTBOURNE.—Enlargement of Trinity Church (£5,000).

ECCLES.—Eleven houses for the Corporation. L. Barlow, architect, Eccles.

EDGWORTH (near Bolton).—Fourteen houses and a store in Blackburn Road. Edgworth Co-operative Society.

New village institute. Architect, Faulkner Armitage, Altrincham, Cheshire.

Extensions at Wellington Mills for James Booth & Sons.

New Institute at the Recreation Ground.

EDMONTON (Middlesex).—New hall for St. Peter's, Lower Edmonton (seat 370).

ELGIN.—Addition to farm of Moneydie, Auchintone. Charles C. Doig, architect, Elgin.

ELLAND.—Houses, Park Road, for J. Knowles.

EPPING.—New Manse in Lindsey Street, for the Congregational Church. E. F. Willson, architect, Hemnall Street, Epping.

EPSOM (Banstead).—New church at Burgh Heath (£4,800). Roberts & Son, builders, Islington, N.

FARNBOROUGH.—Additions to "The Cedars" for Col. Moores.

FARNWORTH (near Bolton).—Four houses in Kildare Street, for J. R. Hodgkiss; four houses, Buckly Lane, for S. J. Hodgkiss.

Additions to Oak Cotton Mills for T. Nuttall & Sons.

FILEY.—New Council schools for the East Riding of Yorks C.C. Building surveyor, County Hall, Beverley.

FINGLAS (Co. Dublin).—Alterations and additions to Cappagh House Convalescent Home. W. H. Byrne & Son, architects, 20, Suffolk Street, Dublin.

FLEET (Hants).—Additions to residence, Station Road, for Dr. Butler Savory.

FOLKESTONE.—Proposed new music-hall on the Bayle.

FRINTON-ON-SEA.—House and shop, Connaught Avenue, for P. Wood, and additions to Connaught Avenue Baptist Church.

GLASGOW.—Proposed new tallow-melting works in Salkeld Road, Port Eglinton, for Poynter, Son & Macdonald.

Three tenements of houses. M. Dickie, builder, Mount Florida, Glasgow.

Catholic school, Kinning Park. Rev. Canon Mackintosh.

New transformer station for the Corporation Electricity Department.

GODALMING.—New post office premises under consideration.

GOSPORT.—Proposed new school for the Gosport and Alverstoke Education Committee. G. R. Walker, secretary to the Education Committee, High Street, Gosport.

GRAVESEND.—Business premises and houses, Milton Road. G. E. Clay, architect, 27, King Street, Gravesend; G. F. Tuffee, builder, Pelham Road, Gravesend.

GREENOCK.—New chemical works, corner of Bearhope and Roxburgh Streets.

HAMILTON.—Iron-works. McDonald & Sons, Crieff.

Building for wagon works. A. Russell, Ltd.

HAMPTON (Middlesex).—Refuse distributor for the U.D.C. S. H. Chambers surveyor to the U.D.C., Hampton.

HANDFORTH (Cheshire).—Alterations at Railway Inn.

HARPENDEN (Herts.).—Houses, Holybush Lane, for E. C. Jarvis.

HARWOOD (near Bolton).—New houses for J. Ramsden, G. H. Threadgould and R. Isherwood.

HASTINGS.—Residence for Geo. Mercer. A. Midmer, builder, Hastings.

HAZEL GROVE (Cheshire).—Houses, Bramall Lane, for D. Wilson; Ethel Road, for J. Wadsworth; Ack Lane, for W. A. Holmes; Maple Road, for Corrie & Son; and Nevill Street, for Wm. Pickford.

HEYWOOD (Lancs.).—Alterations and additions to the Technical School for the T.C. (£7,000).

HOWICK (near Preston).—New Primitive Methodist Church. Trustees.

HUDDERSFIELD.—Semi-detached bungalows in Almondbury Bank. Dennis Bamford, architect, 3, Faraday Mansions, Queen's Club Gardens, London, W.

HULL.—Extensions to the Town Hall for the T.C. (£100,000). Russell and Cooper, architects.

New licensed premises for the Hull Brewery Co. and Moor and Robson's Breweries, Ltd. P. Gaskell, architect, Hull.

ILFORD.—Ten houses. E. T. Dunn, 7, Roding Street, Ilford, architect.

Six houses. Webb & Neilson, Harley House, Ilford, surveyors.

Houses, Coventry Road, for F. B. Harrison.

Additions to 7-11, Seven Kings Road. Ward & Ward, architects, 265, High Road, Ilford.

Six houses, Seven Kings Road. Rawlins & Co., agents, 46, Queen Victoria Street, E.C.

IPSWICH.—Additions to Tattingstone Workhouse for Samford B.G. H. J. Wright, architect, 4, Museum Street, Ipswich.

IRLAM (Lancs.).—Shops at Cadishead for W. and J. Garner.

KEARSLEY (near Bolton).—Three houses, Manchester Road. S. Street.

KEITH.—Shops, offices and residence in Mid Street. F. D. Robertson, architect, Fife-Keith.

KENDAL.—Important additions to Netherfield Works for Somervell Bros., boot manufacturers. W. A. Nelson, architect, Kendal.

KING'S LYNN.—New garage, Ferry Street. Globe Hotel Co.

Additions to laundry. F. Eagle, Southgate Street.

KING'S NORTON.—New public offices for the King's Norton Council.

KIRKHILL (Inverness-shire).—U.F. Church. R. J. Macbeth, architect, Inverness.

KIVETON PARK (near Sheffield).—Houses, Anston, for G. Coggan; Lindrick, for H. L. Longbottom; Dinnington, for C. R. Revill.

LEEDS.—Residence and shop at Bramley for Wm. Abbott. J. A. Webster, architect, 2, Basinghall Square, Basinghall Street, Leeds.

LEICESTER.—St. Philip's Church, Evington (£6,000). Rev. W. J. Dearlove.

New Sunday Schools, St. Augustine's Parish. Rev. J. Casson.

New razor works to be established at North Evington.

Works extensions for the British United Machinery Co. (boot-making machinery).

LEVEN (Fife).—New infant school at Parkhill. Haxton & Walker, architects, Leven.

LEVENSHULME (Manchester).—Enlargement of St. Peter's School.

LINCOLN.—Houses, West Parade, for the Lincoln Land and Building Society; Greetwell Gate, for F. Melson; Tealby Street, for C. Stiles.

LISCARD (Cheshire).—New Masonic Hall in Manor Road for Wallasey Masonic Hall Co., Ltd. J. W. B. Harding, architect and surveyor, 16, Cook Street, Liverpool, W.

LITTLEHAMPTON.—Public shelter (estimated cost £1,500). Mr. H. Howard, town surveyor, Littlehampton.

LIVERSEDGE.—Houses at Robert-town. Lister Coates, architect, 10, Central Street, Halifax.

LLANDAFF (near Cardiff).—Detached residence. R. B. Batchelor, architect, 53, Queen Street, Cardiff.

LLANGOLLEN.—Alterations and additions to the Liberal Club premises for R. Edwards, Islwyn. E. Vaughan-Edmunds, architect, Llangollen.

LONDON (Islington, N.).—Electrical installation for heating and lighting by residents in Whitehall Park.

(Blackfriars Road, S.E.).—Rebuilding premises of J. Gosnell and Co., Ltd., perfumers, &c. (recently destroyed by fire).

(Strand, W.C.).—Beer, &c., stores and stables. A. Burr, architect, 85, Gower Street, W.

(Marylebone, W.).—Winter garden at Great Central Hotel. Sir Horace Regnart, 29, Gordon Square, W.C.

(Hampstead Way, N.W.).—Development of estate. Parker and Unwin, architects, Wildes Farm, North End, N.W.

(Hendon, N.W.).—Seventeen houses in two roads. Edwin Evans, agent, 253, Lavender Hill, S.W.

(Hendon, N.W.).—Additions to factory for A. Garstin & Co. The Hyde, Hendon, leather goods manufacturers.

(Streatham, S.E.).—Additions and alterations to Streatham Hall. R. S. Ronald, builder, 36, St. Ann's Hill, Wandsworth, S.W.

(Hanover Square, W.).—Structural alterations to 18, Berkeley Street, and 31-2, Dover Street. A. Burr, architect, 85, Gower Street, W.

(Hendon, N.W.).—Houses. R. Vernon Hart, builder, Burgess Park, N.W.

(Tottenham, N.).—Extensions of factory for Messrs. Millington. S. Clifford Tee, architect, 50, Moorgate Street, E.C.

(Tottenham, N.).—24 houses in two roads. T. Rowley, 4, Terront Road, South Tottenham.

(Tottenham, N.).—Six houses. S. E. Childs, care of E. Evans, 253, Lavender Hill, S.W.

(Marylebone, W.).—New depôt in Grove Road. J. Paget Waddington, borough surveyor, Town Hall, Marylebone Lane, W.

(Hampstead, N.W.).—Additions to hospital laundry. W. T. Hatch, chief engineer, Metropolitan Asylums Board, Embankment, E.C.

(Tottenham, N.).—21 houses and shop. G. W. Rowley, builder, 278, Philip Lane, South Tottenham.

(Hackney, N.E.).—Installation of electricity in Haggerston Sheet Zinc and Lead Spelter Works, 16 Wharf, Hertford Road.

(Westminster, S.W.).—Building for Thames Bank Wharf Motor Works, Ltd., 112, Grosvenor Road, S.W.

(Bromley).—Kiln house and malt stores at Three Mills Distillery. Brickmay & Sons, architects, 13, Victoria Street, S.W.

(Stratford, E.).—Ten houses and stable. R. Wayman, builder, 29, Forest Lane, E.

(Hackney, N.E.).—Installation for power purposes in premises of G. Ellis & Co., wood-box makers, Lee Conservancy Road.

(Kensington).—New church room. Rev. Prebendary Pennyfather Vicarage Gate, Kensington, W.

(Stepney).—Buildings, Great Alie Street. F. Selby, architect, 44, Chancery Lane, W.C.

(Canning Town, E.).—Machinery store. W. Whitford & Co., engineer, West Ferry Road, Millwall, E.

(Stratford, E.).—Additions and alterations to Rice & Sons' premises. B. Fletcher & Sons, architects, 29, New Bridge Street, E.C.

(Plaistow, E.).—Addition to factory. Newell & Lusty, builders Wilson Street, E.

(Stratford, E.).—Bottling stores. W. E. Trent, architect, 6, Broad Street Place, E.C.

(Woolwich.).—Wesleyan Soldiers' Homes, Artillery Place. Bradshaw & Gass, architects, 108, City Road, E.C.

(Anerley, S.E.).—Additions to workhouse schools. H. J. Chaldecott, Dorking, clerk to the managers.

(Greenwich, S.E.).—New police station and Court House, Blackheath Road.

(Brixton).—Extension of premises for S. A. Newman, 281, Brixton Road. Harris & Sheldon, builders, Stafford Street, Birmingham.

(Tottenham, N.).—Buildings in High Road (£1,500). Warran and Stupart, builders, 262, West Green Road, N., architects; Hale and Co., Harringay.

(Hammersmith, W.).—Shops and flats, Shepherd's Bush Green. Palgrave & Co., architects, 28, Victoria Street, S.W.

(Hammersmith, W.).—Six blocks of flats at Brook Green. F. W. Hingston, architect, Portland House, Basinghall Street, E.C.

(Hendon, N.W.).—Public library (£3,000). Edward Cratney (Davidson & Cratney), architects, Wallsend and Sunderland.

(Hammersmith, W.).—Buildings in Dunraven Road. W. G. Ingram, architect, 4, Verulam Buildings, Gray's Inn, W.C.

(Willesden, N.W.).—Two houses in Mount Pleasant Road. Trant, Brown & Humphreys, architects, 332, High Road, Kilburn.

(Holborn).—Addition to sub-station for Charing Cross, West End and City Electricity Supply Co., Ltd., 60, St. Martin's Lane, W.C.

(Tottenham).—Transformer sub-station for North Metropolitan Electric Supply Co., Taylor's Lane, N.W.

LONDON (Brondesbury Park).—Additions to "Hakoni." W. J. Ancell, architect, 8, Staple Inn, W.C.

(Willesden, N.W.)—Development of estate, Church Road. Done, Hunter & Co., agents, High Road, Cricklewood.

(Willesden, N.W.).—Two shops in High Road. H. Shaw, architect, 60, Nicholl Road, N.W.

LONGTON (Staffs).—Ten houses in Hamilton Road for Tomkinson and Bettelley.

Six houses in Ludwell Road for C. Smith.

Alterations and additions to 20 houses in Wellington Court for V. Jackson.

LUTON.—Houses, Ashburnham Road, for J. Warren; Conway Road, for A. Carter; Reginald Street, for F. Chandler; Westbourne Road, for Brown & Co.

MELTON MOWBRAY.—Houses, Victoria Street, for Mr. Watts; and Craven Street, W., for Mr. Denman.

MAIDSTONE.—Houses, Pine Grove, for G. Colman; and Boxley Road, for Thos. Barrow.

MORTLAKE.—Business premises (£2,200). R. B. Rowell, architect, Triangle Corner, East Sheen.

MURTON COLLIERY (Co. Durham).—New public schools for the C.C. Clark and Moscrop, architects, Feethams, Darlington.

NANTWICH.—Refuse destructor for the U.D.C.

NORWICH.—New wing at the Workhouse Infirmary for the Norwich Board of Guardians (£10,000).

New Municipal Secondary School (£31,500). C. J. Brown, architect, Norwich.

OKEHAMPTON (Devon).—New premises for Lloyd's Bank, Ltd.

OLDBURY.—Houses, Galton Road, for J. F. Strong; Dog Kennel Lane, for E. T. Stokes; Hales Lane, for H. Swain; and Moat Road, for Mrs. Shaw.

New music hall for the North Worcestershire Brewery Co.

OSSETT (Yorks).—Warehouse, &c., at Pildacre Mills. W. A. Kendall, architect, Bank Street, Ossett.

POOLE.—Houses, Wimborne Road, for R. H. Foster (G. F. Iverny, architect); Glenair Road, for A. and F. Wilson (W. Andrew, architect); St. Benund's Road, for Miss C. Paske (C. H. Goater, architect); Mount Road, for W. H. Davey (W. Andrew, architect), and King's Avenue, for G. Cosser (G. W. Jackson, architect).

PORTH (Rhondda).—New John Pugh Memorial Hall (£3,100).

Shops, in Cemetery Road, for John Thomas. J. T. Jenkins, architect, Porth.

PETERBOROUGH.—Three shops and offices. Local Co-operative Society.

RADCLIFFE (Lancs.).—Weaving shed, run by electric power, for G. Mills and Co.

RAMSBOTTOM (Lancs.).—Boiler and economiser houses at Square Works, for Hepburn & Co., Ltd., bleachers and finishers.

New refuse destructor and improved sewage farm. Urban District Council.

RAMSGATE.—Structural alterations at the Royal Oak Hotel.

Reconstruction of the Black Horse Inn, Plains of Waterloo. S. H. Page, architect.

New secondary school for the Kent Education Committee. W. H. Robinson, architect, Caxton House, Westminster, London, S.W.

REDCAR.—New laundry. M. W. S. France, builder, 3, Balmoral Terrace, Redcar.

ROCHDALE (Crompton).—Houses, Fir Lane, for Miss Meadowcroft; and Chamber Road, for T. Milnes.

ROCHESTER.—House and shop in High Street, Strood, for H. T. Tremain.

ROTHERHAM.—Alma Tavern to be rebuilt (£2,500). P. E. Brown, architect, Sheffield.

ROTHIE (Aberdeenshire).—Block of buildings for Geo. Ross, baker, Rothienorman. W. Tennon & Son, architects, Turriff.

ROTHIEMAY (Banff.).—New farmhouse at Lower Inchcorsie. Mr. Duguid, ground officer, Rothiemay.

RUGBY (Bilton).—House in Campbell Road, Mr. Goodwin; three houses, W. Hawksley.

RYDE (I.O.W.).—New Pavilion in the Eastern Esplanade Gardens.

ST. ALBANS.—Additions to stabling, &c., Wheathampstead House, for the Earl of Cavan.

ST. ANDREW'S.—Additions to Abbey Park School (£1,000). Mr. Hendry, architect, St. Andrew's.

SANDBACH (Cheshire).—Alterations at the Rookery Inn.

SANDOWN (Isle of Wight).—Additions to Sandown Hotel (£4,000) for Mrs. E. Saunders. E. R. Barrow, architect, London.

SHEFFIELD.—Baptist Church at Swallownest. J. W. Winter, builder, Handsworth, Sheffield.

Additions and alterations to Glossop Road Baths for the T.C. A. Nunweek, architect, Town Hall Chambers, Sheffield.

SHIPLEY.—Semi-detached houses, Greencliffe Park, Baildon. J. Harper Bakes, architect, Calverley Chambers, Victoria Square, Leeds.

SKERRIES (Co. Dublin).—Carnegie Library.

SOUTHGATE (Middlesex).—Extensions to the Council Offices (£300).

SOUTH MOLTON (Devon).—New residence for the Wesleyan minister. W. C. Oliver & Son, architects, Bride End, Barnstaple.

SOUTH SHIELDS.—Extensions to pavilions, laundry buildings, &c., at Union Workhouse, West Hartow, South Shields. J. H. Morton, architect, King Street, South Shields.

STAFFORD.—Houses, Cambridge Street, for A. M. James, and Tithe Barn Road, for W. Addison.

STANDISH (near Wigan).—New sewerage works in Bradley Lane. Standish Urban Council.

STOCKPORT.—Houses (26) on new estate at Reddish, for Mr. Church.

Houses at Woodley, for the Co-operative Society, and J. Bramall.

STONEHAVEN.—House for M. A. Hamilton, Procurator Fiscal.

SUTTON-IN-ASHFIELD.—Houses, Regent Street, for John Keeling; Alfreton Road, for W. Searson; Doreen Drive, for Speed & Shore; Mason Street, for J. Archer; Hucknall Road, for Mrs. Crofts; Skegby Road, for G. Hardy.

SWADLINCOTE.—Houses, Sunnyside; new hall, for B. Warren, junr.; and Midway Road, for B. Warren, senr.

SWANAGE.—Five shops in Station Road. Parsons & Hayter.

SWANSEA.—Additional workmen's dwellings (£25,000).

Important additions to Christ Church Schools. Margrave and Peacock, architects, Metal Exchange, Swansea.

SWINDON.—New church at Broad Hinton. Read, Osborne & Cook, architects, Regent Circus, Swindon.

Twenty-six houses, Harcourt Road. H. C. Cook, builder, 2, Croft Road, Swindon.

SWINTON (near Manchester).—Six houses, Leinster Street, for J. Lane; four houses, Mulgrave Street, Swinton Co-operative Society.

SWORDS (Co. Dublin).—New national schools at Cloughran, Swords. Rev. D. P. Mulcahy, Pastorville, Swords.

TOLGARTH (Breconshire).—Additions to the Brecon and Radnor Asylum A. J. Astbury, clerk, Tolgarth Asylum.

TADCASTER (Yorks.).—Conversion of Tadcaster Grammar School into Police Station, &c. J. Vickers-Edwards, county architect, County Hall, Wakefield.

TEDDINGTON.—Houses, Coleshill Road for Landen & Read.

THORNTON-LE-FYLDE (Lancs.).—Houses, Stockdove Way for Arthur Swarbrick; Marsh Road for Mr. Porter; Bungalow, Stockdove Way, for Mr. Platt.

THURSO.—Reconstruction of property in Swanson Street for Miss McKay. Brims & MacKay, solicitors, Thurso.

TORPOINT (Cornwall).—New hotel at Port Wrinkle (£8,000) for Mr. Robert Bromhead.

TRURO.—Additions to Royal Cornwall Infirmary. A. J. Cornelius, architect, Truro: M. Clemens, builder, Truro.

TUNSTALL (Staffs.).—Additions to Alexandra Pottery for Johnson's, Ltd. Chas. Cope, builder, Tunstall.

TWERTON-ON-AVON (Bath).—Higher elementary school. Arthur E. Withy, Clerk to the Managers of the Twerton Council Schools, 14, New Bond Street, Bath.

WALKDEN.—New shop in Walkden Road. J. Cocker, builder and contractor, Walken.

WALLASEY.—Masonic temple (£2,550). J. W. Harding, architect, 16, Cook Street, Liverpool.

WALSALL.—Important additions to the works of the New Delaville Spelter Co. Ltd., Bloxwich.

WATERLOO (near Liverpool).—Shops, Midland Terrace, for E. M. Roberts; houses, Milton Road, for D. E. Roberts; Green Lane, Seaforth, for Wm. Williams; Sandy Road, Seaforth, for Thos. Ellams; Glenwyllin Road, for Stephen Ashcroft.

WEASTE (near Manchester).—18 large shops in Eccles New Road for J. Alker. Architects, Senior & Son, Cross Street, Manchester.

WESTCLIFF-ON-SEA.—Proposed new Winter Gardens (£12,000).

WESTON-SUPER-MARE.—New Council Schools at Kewstoke for Somerset C.C. Price & Jane, architects, Waterloo Street, Weston-super-Mare.

WEYBRIDGE.—Conversion of Aberdeen House into municipal offices for the U.D.C.

WEYMOUTH.—New double-fronted house in Spa Road. S. J. Board.

Six new houses in Spa Road. F. Horsey.

WHITEHAVEN.—Alterations and additions to 78 and 79, Church Street for J. Roan. J. N. Singleton, architect, 61, Lowther Street, Whitehaven.

WHITSTABLE.—Houses, Cromwell Road, for Harrison & Uden; and Clare Road, for F. S. Gann.

WICK.—Higher grade school (£5,000). Messrs. McMillan, architects, Aberdeen.

WIGAN.—Important Sewerage Works. Borough Engineer, Wigan.

WINDERMERE.—New farmstead at Sawrey for Colonel Sandys. John Banks, jun., Estate Office, Graythwaite Hall, Newby Bridge, North Lancs.

WOLVERHAMPTON.—Secondary School for girls for the Wolverhampton T.C. and Staffs. Education Committee, jointly.

WORCESTER PARK (Surrey).—Semi-detached residences. Belfrage and Saville, architects, 27, Chancery Lane, London, W.C.

WORKSOP.—Shops, &c., Gateford Road, for G. G. Middleton; houses, Lead Hill, for J. W. Chadwick; Netherton Road for Mr. McCarrick.

WORTHING.—Two houses in Grand Avenue (electric mains laid). E. B. Hayward, builder, Worthing; H. Bartlett, architect, Railway Approach, Worthing.

Three houses in Grove Road, Broadwater (electric mains not yet extended). F. Sandell & Sons, architects and builders, Railway Approach, Worthing.

Rebuilding of Volunteer Inn for H. Chapman, brewer, Worthing.

WREXHAM.—New Regent Hall for Chas. Davis & Co.; and re-construction of the Public Hall for the Public Hall Co.

YEOVIL.—Five houses in St. Michael's Road. H. Hann.

Additions to workshops, Reckleford. J. B. Petter & Sons, Ltd.

Eight houses in St. Michael's Road. Mr. Patridge.

YORK.—New baths for Rowntree & Co., Ltd., cocoa manufacturers (£5,000).

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Brisbane.—April 20th. The representative of the Commonwealth in London (Capt. R. Muirhead Collins, C.M.G.), has received tender forms, specifications, &c., in connection with the supply of lead-covered cable required by the Postmaster-General's Department, Brisbane. These are obtainable at the Commonwealth Offices in London, 72, Victoria Street, Westminster, S.W. Tenders to Deputy Postmaster-General, Brisbane. Forms can be seen at Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, E.C.—*Board of Trade Journal.*

Tasmania.—May 11th. The Postmaster-General at Hobart requires tenders for 200 wall telephones, 800 telephone recorders and cords, and material for common battery and switchboard extensions. Particulars at the G.P.O.

Melbourne.—April 7th. 30½ miles bare hard-drawn copper cables for the City Council. See "Official Notices" to-day.

April 14th.—Two cables between Victoria and Tasmania. See "Official Notices" February 21st.

Austria.—Tenders are about to be invited by the Municipal Authorities of Regen (Siebenburgen) for the establishment of a central electric lighting station in the town, at an estimated cost of £168,000.

Belgium.—April 6th. The municipality of Saventhem is inviting tenders for the supply and erection of plant for the extension of the central electric lighting station, including a 120-H.P. gas engine, dynamo, &c. Particulars for 3 francs from, and tenders to be sent to, Le Collège des Bourgmestres et Echevins, Saventhem.

Brussels.—April 15th. Tenders are required by the Belgian Government Railways Department, 11, Rue de Louvain, for equipment, &c., of an electric signalling cabin at Louvain railway station. The estimate is 13,658·74 francs. A deposit of 1,200 francs is required. Specification, No. 140, may be obtained by sending 7d. to M. de Rudder at the above address.

Bolton.—March 26th. Stores and materials for the Electricity Department. See "Official Notices" March 6th.

Bolton.—The borough electrical engineer has been instructed to obtain an air compressor.

Bourges.—April 24th. The Central Pyrotechnic School invite tenders for an electric crane. Particulars may be obtained from the Secrétaire de l'Ecole Centrale de Pyrotechnic, Bourges (departement du Cher).

Bournemouth.—Oil and grease, and brake blocks for the Council Tramways Department.

Bloemfontein.—April 7th. A motor-generator and switchboard are wanted for the railway workshops. Particulars are obtainable from the Storekeeper, Bloemfontein and Germiston, and from the Transvaal Government agent, 72, Victoria Street, Westminster, S.W.

Bray.—April 7th. Supplies for the U.D.C.'s electricity department. See "Official Notices" March 13th.

Bremen.—March 30th. Municipal Authorities. A sewage pumping station, for which the pumps are to be driven electrically, and must be able to lift 150 litres of effluent per second. Particulars obtained by sending 1s. (not in stamps) to the Director der Tiefbauinspection I, 36/37 Tiefer Barmen, labelling envelope "Pumpwerk Woltmershausa."

Bristol.—April 7th. Stores for the Electricity Department. See "Official Notices" to-day.

Crajova.—A concession to install and work for 50 years an underground system of electric tramways is to be thrown open for international competition. A deposit of £200, to be raised to £1,000, is required, and particulars may be obtained from the Chief Magistrate of the Town.

Czernowitz.—April 21st. A waterworks station worked by electricity and lighted by electric incandescent lamps is to be erected and equipped. Particulars may be obtained from the Director des Städtischen Betriebsleitung.

Darwen.—March 23rd. The rights of advertising on the Corporation's tramcars for a period of 5 years from April 1st, 1908. Specifications may be obtained on deposit of £1 1s. with Mr. R. W. Smith Saville, Borough Engineer.

Dewsbury.—March 30th. Surface condenser and cooling tower for the Electricity Committee. See "Official Notices" March 6th.

Edinburgh.—March 30th. Materials for the Electricity Supply Department. See "Official Notices" March 13th.

Felixstowe.—March 25th. Storage battery and booster for the U.D.C.

Gillingham.—March 23rd. Meters and oils for the B.C. electricity department. See "Official Notices" March 6th.

Glasgow.—April 6th. Stores for the Corporation Tramway Department. Purchasing department, 46, Bath Street.

Hackney.—March 26th. Annual supply of lubricating oils for Borough Electricity Department. Forms, W. A. Williams, Town Clerk, Town Hall, Mare Street.

Halifax.—March 24th. Electrical fittings for six months for the Board of Guardians. A. T. Longbottom, Clerk to the Board of Guardians, 4, Carlton Street, Halifax.

Huddersfield.—March 25th. Single-phase A.C. meters for the Electricity Department. See "Official Notices" March 13th.

Hull.—March 26th. Mains for the electricity department. See "Official Notices" March 13th.

Holland.—Kampen.—Municipal tramways, estimated to cost 495,000 florins (about £40,000).

The Hague.—Tramway equipment of: (1) Lines from Gouda to Rotterdam; (2) lines from Gouda to Schoonhoven; and (3) line from Gouda to Oudenwater. J. H. Mueller, The Hague.

Kassel.—March 27th. The Russian Government Railways require tenders for a 3,000-kg. motor-driven crane. K. Eisenbahn-direction.

Lancs. & Yorks. Railway.—March 30th. Telegraph and electric light wires for one year. Mr. Waring, Stores Department, L. & Y. Railway, Osborne Street, Manchester.

Leeds.—March 31st. Coal and stores for the E.L. Department. See "Official Notices" March 13th.

Leek.—April 11th. Gas producer plant and one gas-driven generator for the U.D.C. See "Official Notices" to-day.

Manchester.—March 25th. 6,000-kw. turbo-alternator, with exciter and condensing plant complete, for the Electricity Department. See "Official Notices" March 6th.

Nottingham.—March 26th. Stores for the City Tramways Committee. Mr. J. Aldworth, general manager.

Partick.—April 4th. Stores for the Electricity Department. See "Official Notices" to-day.

Rawtenstall.—March 23rd and 27th. Direct and alternating-current meters and economisers, for the electricity supply department. Rails, permanent-way work, &c., for the tramways department. See "Official Notices" March 6th.

St. Nazaire.—March 25th. Tenders will shortly be called for apparatus to manipulate a swing-bridge at the harbour. Application for forms must be made before March 25th to M. Mallat, Ingenieur-en-chef des ponts et chaussées.

St. Pancras.—March 23rd. Arc lamp carbons for the B.C. See "Official Notices" February 28th.

Salford.—March 30th. Stores for the Electricity Department. See "Official Notices" to-day.

Sophia.—March 28th. The Post and Telegraph Department requires tenders for office material for the Post and Telegraph service, estimated at £1,000.

Spain.—Madrid.—April 8th. The Spanish Ministry of Posts and Telegraphs in Madrid is inviting tenders for the laying and working of a submarine telegraph cable between Cadiz and Teneriffe and Las Palmas. Particulars may be obtained from, and tenders are to be sent to, La Direccion General de Correos y Telegrafos, Madrid.

Spain.—Madrid.—April 2nd. The Post and Telegraph Department requires tenders for the concession for the installation and working of wireless telegraphic communication throughout Spain, as well as between the mainland of Spain and the adjoining islands. Particulars may be obtained at the Direccion General of the Department; the employment of a local agent is advised.

Spain.—April 30th. The Spanish Ministry of Public Works in Madrid is inviting tenders for the concession for the construction and working of an electric tramway in the town of Bilbao. Particulars may be obtained from, and tenders are to be sent to, La Direccion General de Obras Publicas, Madrid.

Stutterheim (Cape Colony).—The Municipality has been inviting tenders for an electric lighting installation.

Sunderland.—April 9th. Stores for the Corporation's Tramway Department. See "Official Notices" to-day.

Sunderland.—Bitumen-insulated cables for the workhouse. W. & T. R. Milburn, architects, 20, Fawcett Street, Sunderland.

Sunderland.—March 27th. Three additional turn-outs on the main tramline between Philadelphia and Silksworth. Manager, Sunderland and District Electric Tramways, Ltd., Philadelphia, Co. Durham.

Swindon.—March 21st. Tramway and electricity supply materials, coal, &c., for the Corporation. See "Official Notices" March 6th.

Valparaiso.—May 30th. The Junta Economica de la Direccion del Material of the Navy Department requires tenders for the equipment of the Chilian Navy with electrical instruments, motors and fittings. The successful tenderer will hold the contract for 5 years.

Whitehaven.—March 26th. Battery and booster switchboard, and battery booster for the electricity department. See "Official Notices" March 13th.

Whitehaven.—Electric power installation at the Whitehaven Colliery Co.'s works.

Wigan.—March 23rd. Advertising on tramcar tickets (12,000,000). Manager, Corporation Tramways, Bradford Place.

Wigan.—March 25th. Electric lighting or gas installation for the new workhouse infirmary for the Guardians. Heaton, Ralph & Heaton, architects, Victoria Buildings, King Street, Wigan.

CLOSED.

Australia.—Melbourne.—The Postmaster-General has accepted the tender of Mr. R. B. Hungerford, at £2,989, for five sections of a telephone switchboard for incoming junction lines at the Central Telegraph Exchange, Melbourne.

Barnes.—The D.C. has accepted the tender of Messrs. Babcock & Wilcox, Ltd., at £855, for a locomotive crane.

Bolton.—The tender of Messrs. Jackson Bros. for pipes connected with the cooling tower, and floor plates, at the electricity works has been accepted.

Brazil.—The Government of the State of Amazonas issued a notice, dated February 4th, announcing that a public competition would be held 60 days after that date for the adjudication of the contract for public and private illumination, and provision of electric power for traction and industrial purposes in the city of Manaos. A copy of the *A Provincia do Pará*, which contains the conditions of contract, may be consulted at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

France.—The French Post and Telegraph Authorities in Paris have just placed contracts as follows: La Compagnie Française des Métaux, Paris, 100 tons of high-conductivity wire, 2½ mm. dia., at 2,340 fr. per ton; Les Mines et Fonderies de Pontgibaud, 100 tons ditto, at 2,325 fr. per ton; Les Trefileries du Havre, 100 tons ditto, at 2,349 fr. per ton, and 110 ditto, 3 mm. dia., at 2,339 fr. per ton; M. Grammont, of Pont de Cherny, 100 tons ditto, 3 mm. dia., at 2,335 fr. per ton; La Compagnie Générale d'Electricité, Paris, 100 tons ditto, 4 mm. dia., at 2,310 fr. per ton, and 60 tons ditto, 5 mm. dia., at 2,300 fr. per ton.

Heston and Isleworth.—The U.D.C. has accepted the tender of Messrs. W. T. Henley's Telegraph Works Co., Ltd., for various cables, at prices quoted on a basis of copper at £60 per ton and lead at £15 per ton. It has also accepted the tender of the same firm for disconnecting boxes and house service boxes, as well as wooden bridge pieces and compound; the tender of the British Insulated and Helsby Cables, Ltd., for house fuse boxes, and that of Messrs. Geipel & Lange for carbons, at £3 7s. 6d. per 1,000. The tender of the Leeds Fireclay Co. was accepted for earthenware troughs and hard burnt tiles.

Johannesburg.—At a special meeting of the T.C. on February 13th, the report of the Tramways and Lighting Committee was dealt with. It may be remembered that the Victoria Falls Co. supply the municipality with 1,700 KW., of which 400 KW. is used in the inner area, and 1,300 KW. in the suburban area, and it was decided in December last not to renew the contract. It was therefore necessary to invite tenders for additional steam plant of 1,500 KW., in two units of 1,000 KW. and 500 KW. respectively, which would be just sufficient to meet the town's present requirements. The following recommendations were adopted:—

1. That the tender of Messrs. Reunert & Lenz be accepted for the supply and erection of a 1,000-KW. Belliss-E.C.C. two-phase alternator at 300 R.P.M., to be erected within 19 weeks from date of contract (£4,567).

2. That the tender of Messrs. Reunert & Lenz be accepted for the supply and erection of three Babcock & Wilcox boilers, to be erected within 18 weeks from date of contract (£7,095).

3. That the tender of Messrs. Reunert & Lenz be accepted for the erection of chimney and flue within 17 weeks from date of contract (£1,925).

4. That the tender of Messrs. Sykes & Co. be accepted for the supply of two Blake vertical feed pumps with spares, to be delivered within 19 weeks from date of contract (£203).

5. That an expenditure of £5,600 be authorised for alterations and extensions at the engine room of the power station, and £1,250 for provision of steam feed and exhaust pipes, and £650 for cable connections to switchboard.

London.—CAMBERWELL.—The B.C. has accepted the following tenders for annual supplies:—

Electric lamps, plain (English make), Britannia Electric Lamp Works (1905), Ltd., own make, 100 volts, 8 and 16-C.P., 5s. per doz., 32-C.P., 5s. 6d.; 200 volts, 8 and 16-C.P., 5s. 6d. per doz., 32-C.P., 6s. per doz.
Electric lamps, frosted (English make), 100 volts, 8 and 16-C.P., 5s. 6d. per doz., 32-C.P., 6s.; 200 volts, 8 and 16 C.P., 6s., 32-C.P., 6s. 6d.
"Osram" electric lamps, 100 volts, Geipel & Lange, 50-C.P., £1 16s., 50-C.P., £1 18s. 3d.

L.C.C.—The Asylums Committee of the L.C.C. has accepted tenders for the annual supply of electric light sundries from the British Thomson-Houston Co., Ltd., General Electric Co., Ltd., Baxter & Caunter, Pryke & Palmer, H. S. Timpson, and the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.

BERMONDSEY.—The B.C. has accepted the tender of the Brush Electrical Engineering Co., Ltd., at £23, for spare parts for 500-KW. set.

The following tenders have been received by the L.C.C. for the supply (1) of a 10-ton overhead travelling crane for the Hammersmith temporary tramway sub-station, and (2) of special trackwork for the tramways between Brixton Road and Camberwell Green:—

1.—*Overhead Travelling Crane.*

John Smith (Keighley), Ltd. (recommended)	£159
Carrick & Ritchie	201
T. Larmuth & Co.	210

2.—*Special Trackwork.*

Lorain Steel Co.	£833 10s.
Hadfield's Steel Foundry Co. (recommended)	838 12s.
Edgar Allen & Co.	883 10s.

The tender of the Lorain Co. was on the basis of the County Council supplying to the company, free of charge, wrought rails for use in manufacturing the crossings required, instead of these being made of cast-steel in the usual manner. The value of these rails would be about £35, thus making the amount of the company's tender in effect £30 higher than the second lowest tender, whilst at the same time the Lorain Co. could not deliver the special work by the time required.

WEST HAM.—The Education Committee has placed an order with the borough electrical engineer for the supply of "Osram" lamps at the following rates: 30-C.P. lamps, 4s.; 50-C.P. lamps, 4s. 3d.

ST. PANCRAS.—The B.C. has accepted the tender of Messrs. Brentnall & Cleland to supply 500 tons of best hand-picked "Desford" steam coal, at 15s. 8d. per ton, delivered to either electricity station, subject to a condition that this supply be discontinued so soon as Messrs. Barber-Walker's collieries re-open after the strike, and the Council can be supplied therefrom under its contract.

Whitehaven.—The T.C. has accepted the tender of the Tudor Accumulator Co., Ltd., for a battery (244 cells), and maintenance for 10 years at £113 per annum.

Whitehaven.—The T.C. has accepted the following tenders for annual supplies:—

British Thomson-Houston Co.—Carbon filament lamps.
Siemens Bros.—Metallic filament lamps.
Farringdon Engineering Co.—Okonite rubber and tapes.
Ferranti, Ltd., and Chamberlain & Hookham.—Electricity meters.
British Insulated & Helsby Cables, Ltd.—Fuse boxes.

Wolverhampton.—The Empire Roller Bearings Co., Ltd., have received an order from the Corporation for fitting further cars with roller bearing axle-boxes.

FORTHCOMING EVENTS.

To-day's Events (Friday, March 20th).—At 9 p.m. Royal Institution. Discourse on "Recent Earthquakes," by Prof. J. Milne.

Saturday, March 21st.—At 3 p.m. Royal Institution. "Electric Discharges through Gases," by Prof. J. J. Thomson. (Lecture III.)
At 6.30 p.m. Junior Institution of Engineers. Reception at Caxton Hall, Westminster, S.W.

Monday, March 23rd.—At 8 p.m. Royal Society of Arts. Cantor Lecture on "Fuel and its Future," by Prof. V. B. Lewes. (Lecture III.)

Tuesday, March 24th.—At 8 p.m. Liverpool and District Electrical Association. Paper by a member on "Static Transformers in Practice."
At 8 p.m. At the Institution of Electrical Engineers. Faraday Society. Presidential address on "Some Aspects of the Work of Lord Kelvin," by Sir O. Lodge, F.R.S.

Wednesday, March 25th.—At 7.30 p.m. Institution of Electrical Engineers Students' meeting. Paper on "The Motor-Converter," by Mr. H. W. Gregory.
Institution of Civil Engineers (Students). Visit to the works of the India-Rubber, Gutta-Percha and Telegraph Works Co., Silvertown.

Thursday, March 26th.—At 3 p.m. Royal Institution. Lecture on "Standardisation in Various Aspects. II.—Electrical Engineering," by Dr. R. T. Glazebrook.
At 8 p.m. Royal Society of Arts. Howard Lecture on "The Navigation of the Air," by Prof. H. S. Hele-Shaw.

Friday, March 27th.—At 9 p.m. Royal Institution. Discourse on "The Radio-Active Change in the Earth," by Hon. R. J. Strutt, M.A., F.R.S.
At 5 p.m. At the Northampton Institute. Physical Society. Dr. C. V. Drysdale on (1) Notes on the Plug Permeameter; (2) The use of Shunts and Transformers with Alternate-Current Measuring Instruments; (3) Wattmeters.
At 8 p.m. At Cannon Street Hotel. Electro-Harmonic Society. Last Smoking Concert of the season.

Saturday, March 28th.—At 3 p.m. Liverpool and District Electrical Association. Visit to ss. *Lusitania* (if in dock).
At 3 p.m. Royal Institution. Lecture on "Electric Discharges through Gases," by Prof. J. J. Thomson.
At 10 a.m. Institution of Electrical Engineers. Students' Visit to the Thames Ironworks. Meet at the works.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are announced:—

Monday, March 23rd.—"A" Company. Infantry drill, 6 p.m.; technical drill, 7 p.m.

Tuesday, March 24th.—"B" Company. Infantry drill, 6.30 p.m.; technical drill, 7.30 p.m. Medical examination for recruits, 7 p.m.

Wednesday, March 25th.—"A" Badge examination, 6 p.m.

Thursday, March 26th.—"C" Company. Infantry drill, 6.30 p.m.; technical drill, 7.30 p.m.

Friday, March 27th.—"D" Company. Infantry drill, 6.30 p.m.; technical drill, 7.30 p.m.

J. H. S. PHILLIPS, Capt.,
Acting Adjutan

Copper.—Messrs. Merton's circulars for February 15th and 29th showed the large increase in visible supplies which was the most prominent feature of the market. For the 15th supplies were 22,175 tons, and for the 29th, 20,773. The prices were £58 10s. and £58 2s. 6d. respectively. For February 28th, 1907, the supplies were 13,483 tons, and the price £108 10s. The price continued to fall. Australia was well to the front in shipments with 3,000 tons afloat at the end of the month. Supplies from Spain and Portugal were up to the average, from America considerably below. Stocks in England and France doubled those for the same date of 1907.

At the time of writing, while the price of this metal has rallied slightly, the prospects of trade in general do not seem such as to cause continued hardening in the face of present supplies. For March 14th these are returned in Messrs. Merton's circular as 23,505 tons; at the end of March, 1907, the quantity was 15,007. The increase over the 20,773 tons for the end of last month is traceable partly to shipments afloat from Chili and Australia, and partly to larger stocks at the French ports. Stocks in Liverpool are about the same.

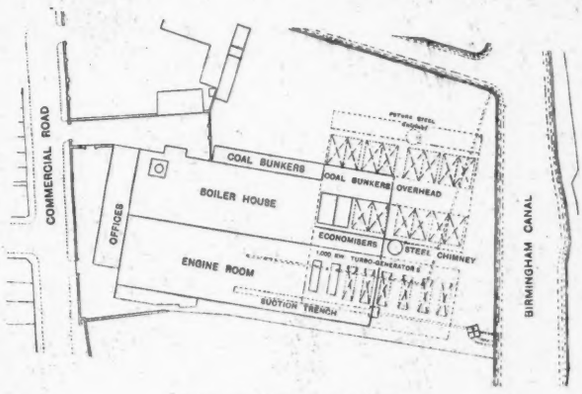
WOLVERHAMPTON CORPORATION ELECTRICITY WORKS EXTENSIONS.

On Monday last, as recorded elsewhere in this issue, the new plant installed in the Wolverhampton Corporation Electricity Works was formally inaugurated. The additions consist in the main of two 1,000-KW. turbo-alternators, 6,600 volts three-phase 50 cycles; a switchboard to correspond, including provision for five feeders, a motor-generator and a motor-converter; two boilers, economisers, feed pumps, steel chimney, and feed-water tank.

As will be gathered from the accompanying plan, the new plant fills half the space at present available for extensions; after the further addition of a pair of larger sets, the capacity of the building will be completely occupied That the borough electrical engineer, Mr. C. E. C. Shawfield, confidently anticipates an early call for these additions is evident from the forethought with which a much larger extension is already planned; and an examination of the following table will show that, judging by recent progress, especially in connection with the power load, his confidence is justified. It is noticeable that while the motor load has more than doubled during the last two years, the load factor has not improved on the whole; the works cost, however,

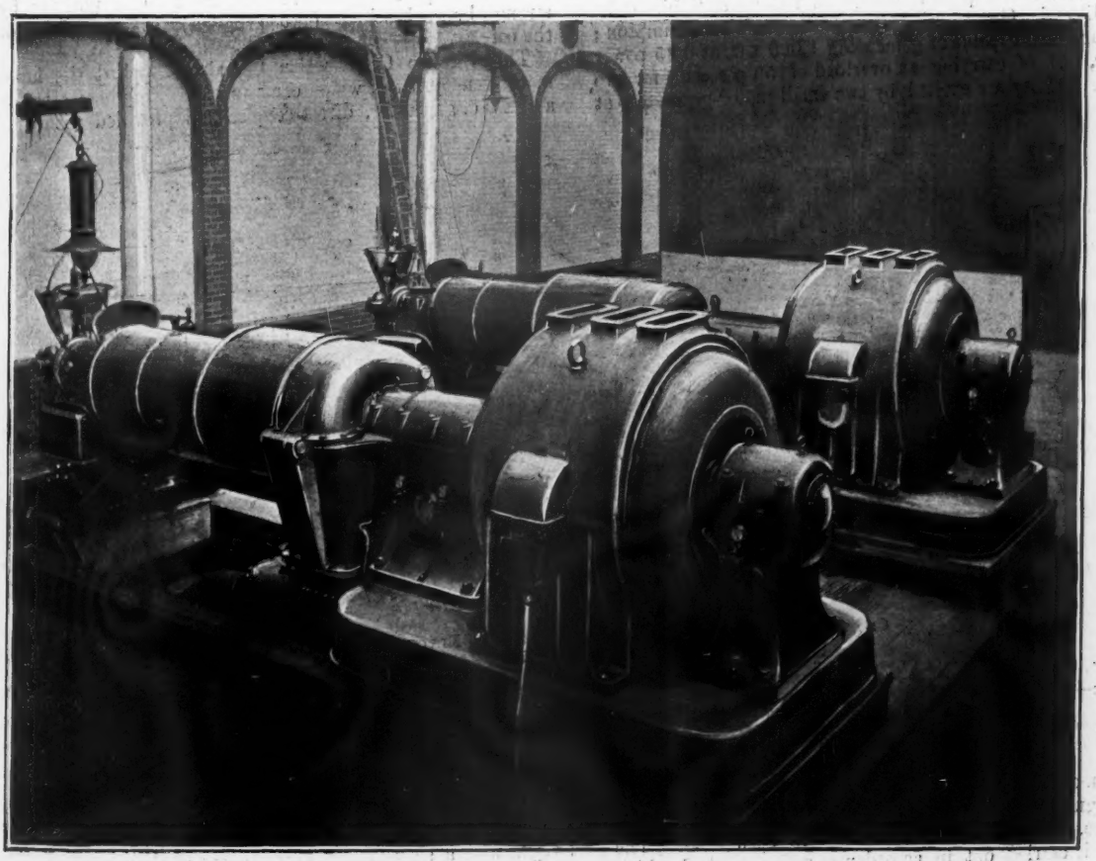
Year ending March 31st.	Units sold.		Max. load KW.	Load factor.	Motor B.H.P. connected	Works cost.
	Motors.	Tramways.				
1904	385,554	776,358	1,295	17·3%	500	·811
1905	504,392	1,281,636	1,460	20·5%	660	·561
1906	741,118	1,516,327	1,667	22·0%	873	·500
1907	1,186,497	1,585,992	2,075	21·3%	1,539	·497
Nine months, Dec. 31, 1907.	1,298,040	1,160,152	2,450	20·5%	1,960	·471

shows a steady fall. Apparently, therefore, the increase in output has had a much greater influence than the load factor on the works cost of production, and as the former offers no indication of slackening, the prospects of further economies are favourable.



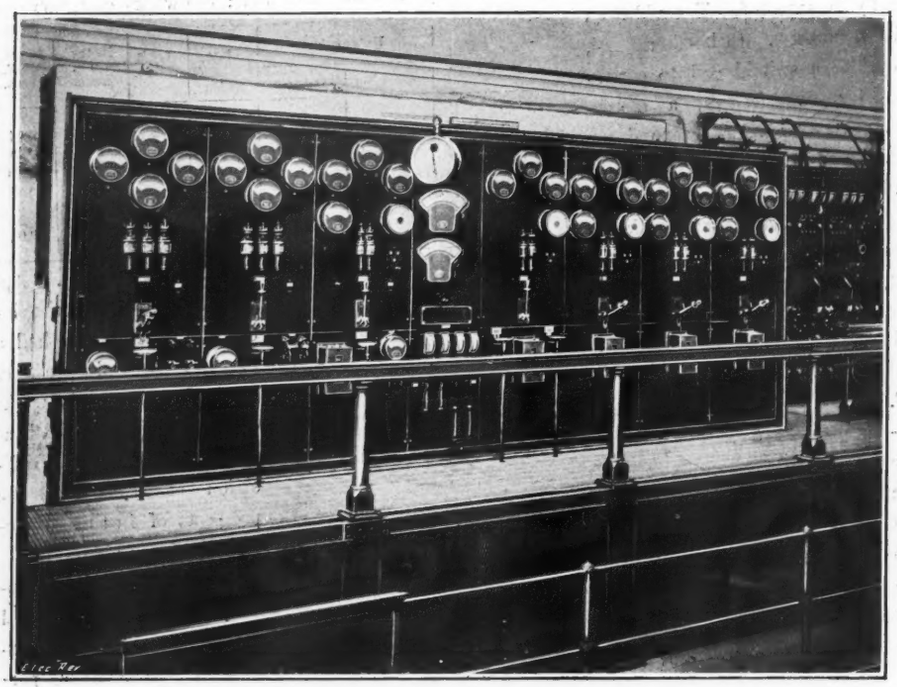
Plan of Works and Site.

The accompanying illustrations show the general arrangement and appearance of the various portions of the plant. The chief contractors were Messrs. Willans & Robinson, who supplied the steam turbines, of their standard pattern,



Willans-E.C.C. Turbo-Alternators.

running at 1,500 R.P.M., and the surface condensing plant, which is situated immediately beneath the turbines. As sub-contractors, Messrs. Thos. Parker, Ltd., Wolverhampton, provided the two circulating pumps, which are situated over the suction trench, fed with water from the adjoining Birmingham canal; they are of the centrifugal type, and are driven by electric motors. Messrs. Parker also supplied the feed pumps, and the exciters for the new generators. The alternators were supplied to Messrs. Willans & Robinson by the Electric Construction Co., Ltd., of Wolverhampton; they are each capable of generating 1,000 KW. at 0·85 power factor, and of carrying an overload of 50 per cent. for two hours. They are excited by two small motor-generators at 75 volts, and have efficiencies, with unity power factor, as follows:—



Extra-High-Pressure Switchboard.

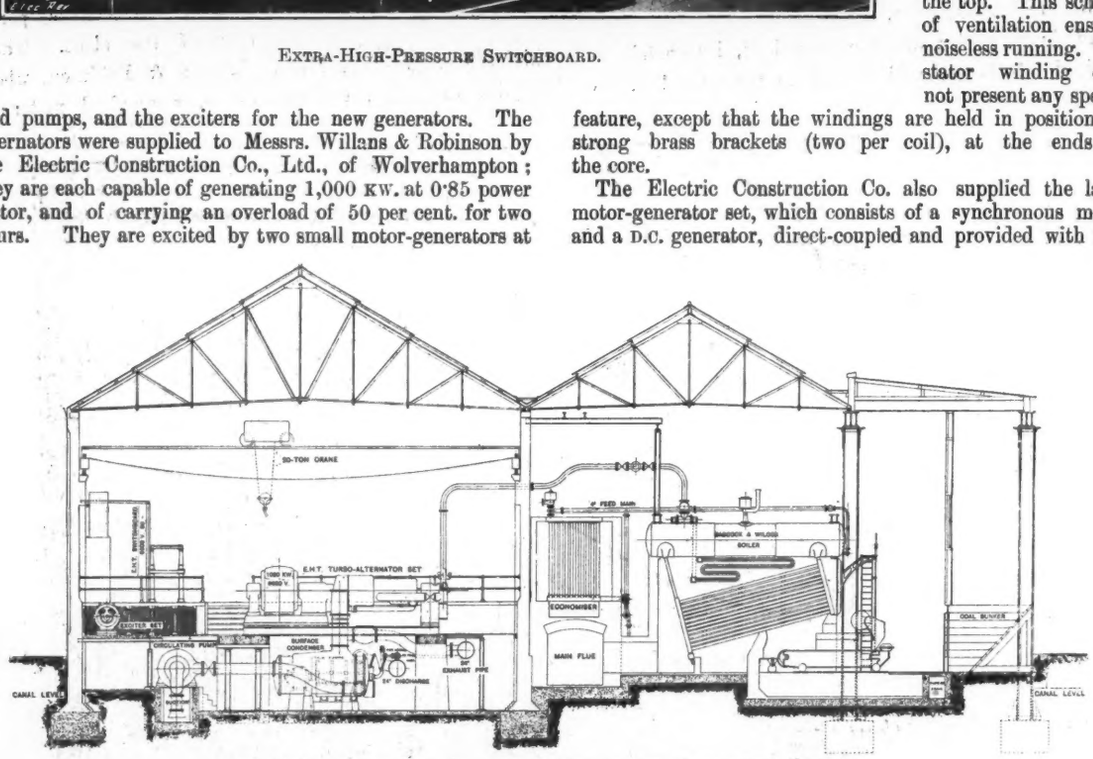
Load	¼	½	¾	1	1½
Efficiency ...	89½	92	94	95	%

The machines are of the four-pole type, with revolving field-magnets; the rotor is of the cylindrical smooth-core type, with distributed windings in open slots. The winding is carried out in accordance with a method which forms a special feature of the E.C.C. design, the slots being not radial, as in Continental practice, but parallel to the polar axis of the magnet. One of theadvantages of this method is that the former-wound coils can be placed directly in the slots without disturbing the form of the coils.

The winding in each slot is sub-divided into two or three sections, according to the depth of the slot, and each section is kept in position by phosphor-bronze wedges. The end connections of the field spool are very firmly secured by strong steel plates and phosphor-bronze keys, and each element is thus supported individually. The field winding consists of flat strip wound on edge and compressed after having been placed in position.

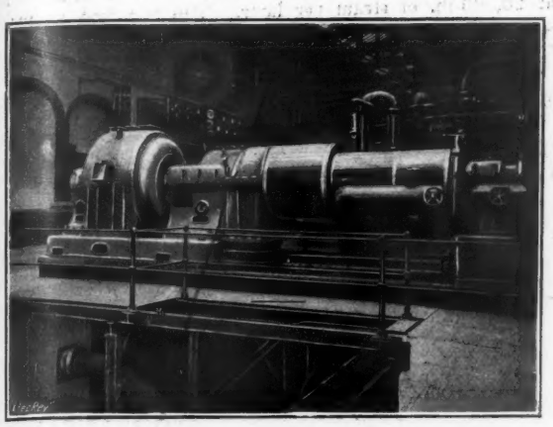
The machine is protected by a strong cast-iron frame with air suction and delivery openings, cold air being drawn in at the base of the machine and discharged from chimney-shaped openings at the top. This scheme of ventilation ensures noiseless running. The stator winding does not present any special feature, except that the windings are held in position by strong brass brackets (two per coil), at the ends of the core.

The Electric Construction Co. also supplied the large motor-generator set, which consists of a synchronous motor and a D.C. generator, direct-coupled and provided with two bearings only. The motor is designed for three-phase supply at 6,000-6,600 volts, 50 cycles, and the generator to give a normal continuous output of 500 KW. at 460-500 volts, the speed of the set being 600 R.P.M.



Cross-section of Wolverhampton Corporation Electricity Works.

The set has an overload capacity of 25 per cent. for four hours, and 50 per cent. for one hour. It is started up from the D.C. side by means of a totally enclosed oil-type starting switch, with a slow-motion arrangement of the ratchet type, by means of which each section of the resistance is cut out



View of Turbo-alternator.

by one stroke of the hand lever. The switch is fitted with a no-voltage release which will release the switch from any position during the starting-up operation, or from the "full on" position.

The motor-converter, which is also rated at 500 KW., was supplied by Messrs. Bruce Peebles & Co., Ltd., and is of their standard pattern.

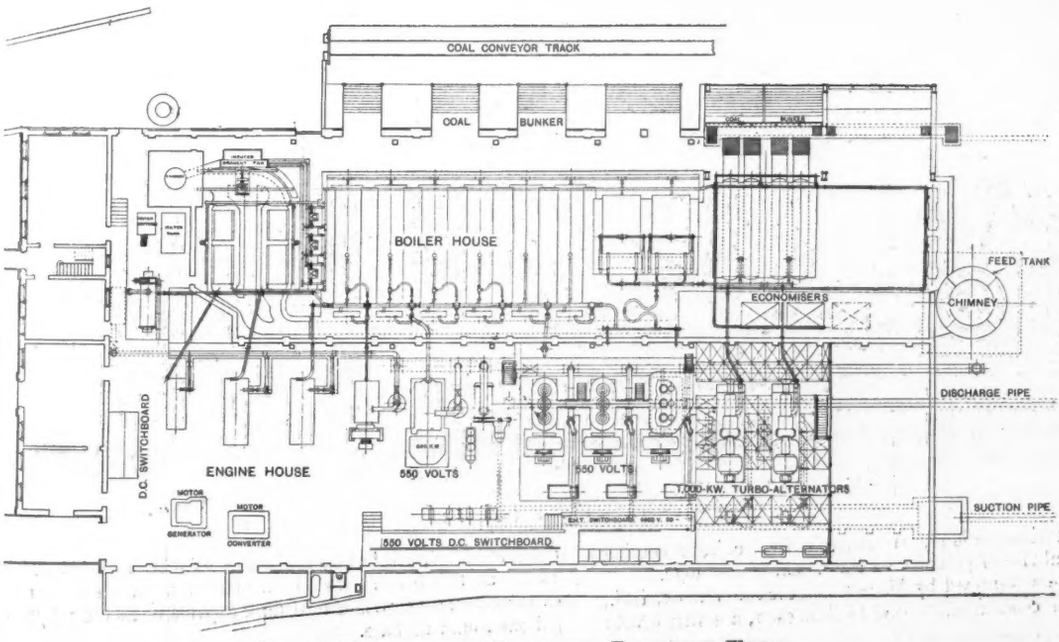
The new extra-high pressure switchboard was constructed by the Electric Construction Co., Ltd.; it is of the cellular type, all the high-pressure apparatus and connections being mounted in moulded concrete cells, built against the wall behind the board, and closed with expanded-metal lock-up doors. The instruments on the board are all operated at low voltage, and the whole arrangement is so designed that in the ordinary working of the board all the high-pressure connections and apparatus are inaccessible to unauthorised persons, and there is absolutely no danger to the operator.

Besides the usual instruments, each generator circuit is provided with an indicating wattmeter for unbalanced loads, and a three-pole reverse time-limit relay; while each feeder circuit is fitted with an integrating watt-hour-meter for unbalanced loads, a three-pole overload time-limit relay, a power-factor indicator, and a set of static dischargers. Similar apparatus are provided on the motor-generator and converter panels, which are also feeder panels; and the eighth panel is fitted with a rotary synchroniser, earth detector, &c.

The main bus-bars are of 0·5 sq. in. bare copper throughout, each phase being totally enclosed in a separate concrete cell. The isolating switches are arranged so that all three poles are operated together; only one key is provided for all the switches. The circuit-breakers are of the E.C.C. standard 6,600-volt type, capable of breaking 2,000 KW. at 10,000 volts, and are fitted with tripping coils wound for direct current. These breakers cannot be held closed against an overload. Should the switch trip automatically, the handle on the operating board immediately moves to the off position, indicating that the circuit has been opened. Each phase has a double break in a separate oil tank. The breakers can be drawn out of their cells on rails.

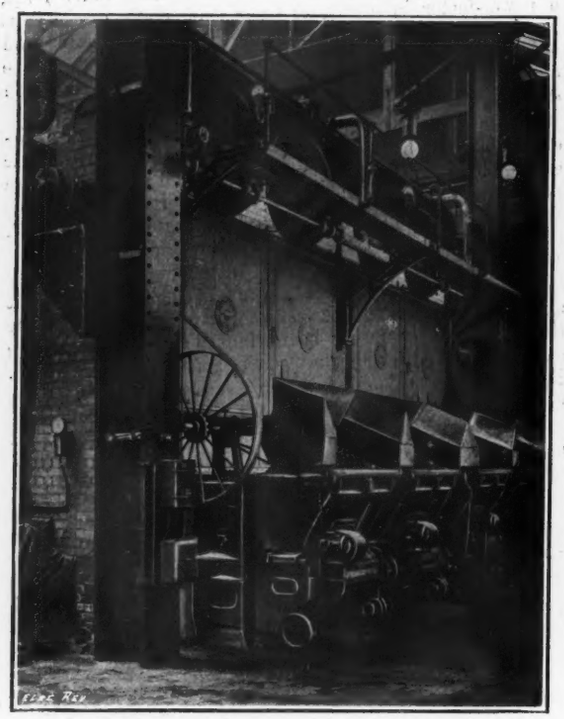
Both the reverse and the overload time-limit relays above-mentioned are of the British Thomson-Houston Co.'s

Motor-generator and Motor-converter.

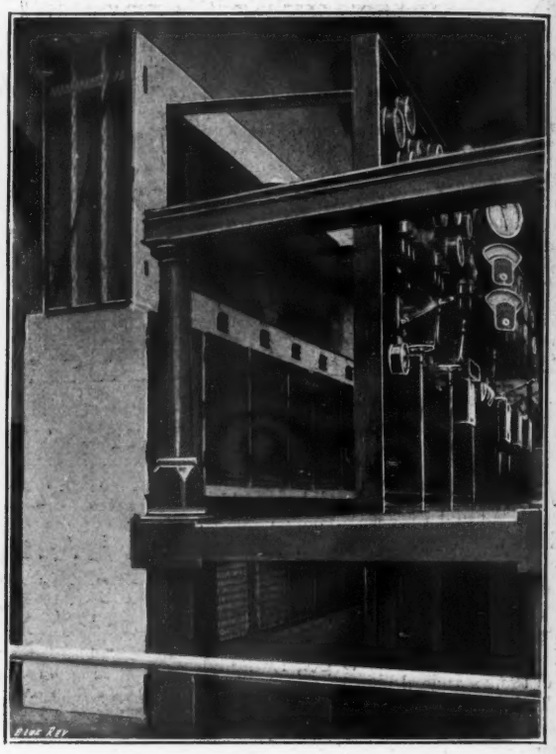


Plan of Wolverhampton Corporation Electricity Works.

standard types, and the other instruments were made by Messrs. Everett, Edgcumbe & Co., with cast-iron cases. The



New Boilers, Wolverhampton.



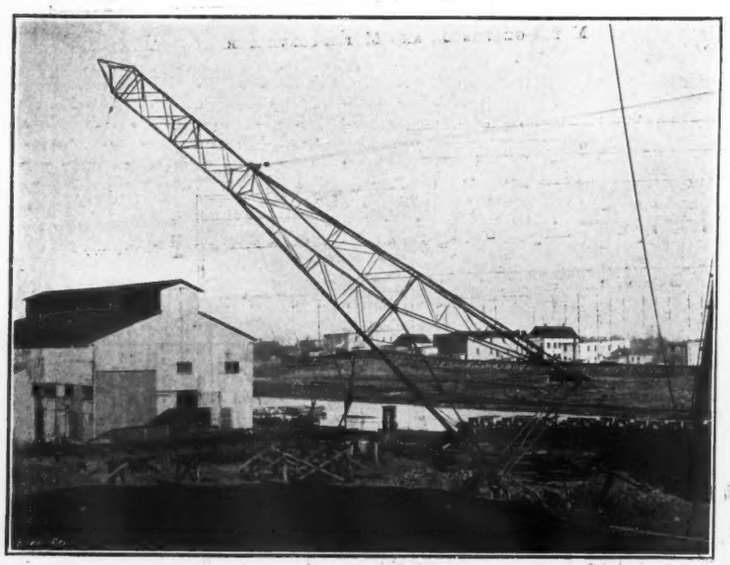
Concrete Cells for Extra-High-Pressure Switchgear.

earth detector is of the electrostatic type, connected direct to the high-voltage bus-bars, and mounted on the cell work; a glass pane in the operating panel enables the operator to see it from the front of the board.

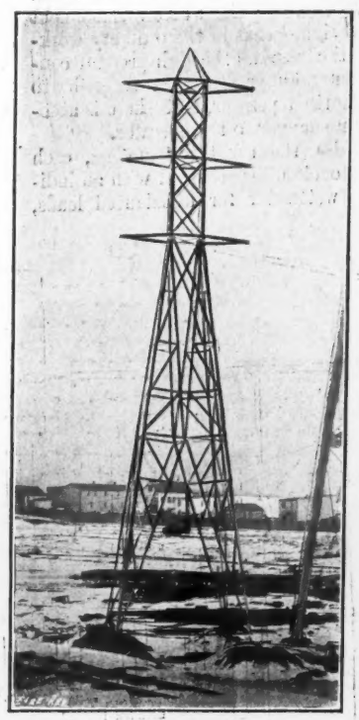
In addition to the switchgear above described, the E.C.C. supplied liquid resistances for the motor-generator and converter panels. The main switches on these panels are of the two-way type, and when switching on the E.H.P. circuit the liquid resistance is put momentarily in circuit, preventing an abnormal rise of pressure on the machine windings.

The boilers, supplied by Messrs. Babcock & Wilcox, Ltd., with Green economisers of 320 tubes each, are fitted with chain-grate stokers and superheaters; each of them is rated at 20,000 lb. of steam per hour. The two feed pumps, supplied by Messrs. Thomas Parker, Ltd., are of the Roturbo type, delivering 6,000 gallons per hour each.

A self-supporting steel chimney, 175 ft. in height above the grate level, and having a diameter of 8 ft. at the top and 11 ft. at the bottom, has been erected at the end of the existing building, with a feed tank capable of holding 8,000 gallons round its base.



Method of Erection.



End View.

Milliken Steel Poles. (See p. 493.)

The following list of contractors shows that the total cost of the extensions has been some £32,600 :—

Description.	Name of firm.	Amount.
Steam turbo-alternators and condensing plant.	Willans & Robinson, Ltd.	£12,514
Switchboard	The Electric Construction Co., Ltd.	£987
Cables	Callender's Cable and Construction Co., Ltd.	£4,000
Boilers, economisers and feed pumps.	Babcock & Wilcox, Ltd.	£5,197
Buildings & foundations ...	H. Gough & Sons ...	£4,55
Steel chimney and feed tank	John Thompson, Dudley ...	£833
Valves	J. Hopkinson	£220
Steam pipes	Foster Bros., Wednesbury	£200
Feed water pipes	John Spencer, Ltd. ...	£70
Floor plates	T. Bridges & Sons... ...	£157
Exciters	T. Parker, Ltd.	£416
Motor-converter (500 KW.)...	Bruce Peebles & Co., Ltd.	£1,405
Motor-generator (500 KW.)...	The Electric Construction Co., Ltd.	£1,484
Switchboard platform ...	St. Pancras Ironwork Co., Ltd.	£130
Voltage regulators, A.C. and D.C.	British Thomson-Houston Co., Ltd.	£420

The charge for lighting in Wolverhampton, for private residences, is 4d. per unit ; hotels and public houses pay 2½d. per unit, and theatres 3d., while shops are charged 5d. per unit (first hour), and 2d. afterwards, on the maximum demand system. Power consumers pay either on the M.D. system, at 2d. (first two hours) and ¾d., if they use their motors less than 50 hours per week ; or 1d. per unit flat rate, if more than 50 hours. Large power consumers—up to 300,000 units per year—are charged ½d. per unit, and still larger ones ⅜d. to ⅝d. It seems, therefore, that Mr. Shawfield is courageously carrying into practice the principles which he advocated at the Convention of the I.M.E.A. last year, namely :—"Adjust the tariff to suit the competition, and the cost of production will adjust itself to the tariff." To live up to such a creed requires an amount of faith which compels our admiration, whatever may be our opinion as to the merits of that policy : and whilst thanking Mr. Shawfield for his kind assistance with materials towards this article, we offer him our cordial good wishes that the means he has adopted may be justified by triumphant success in the end.

MILLIKEN STEEL POLES.

The Great Western Power Co., of California, has adopted the Milliken pole for use in carrying its high-voltage power transmission line, which it is intended eventually to extend for a distance of about 1,000 miles. The power is transmitted on two circuits of three wires each, carrying three-phase current at 100,000 volts. In view of this high voltage, and the consequent risks involved, great care was exercised in selecting the particular class of poles to be adopted.

The pole is designed with three cross-arms, it being intended to carry a conductor on the outer end of each cross-arm by suspended insulators. The top of the pole is arranged to take a guard wire. The poles are to be spaced about 750 ft. apart.

One of our illustrations on the opposite page shows the completed pole at right angles to the cross-arm, while the other shows the same pole viewed parallel with the cross-arm in the act of being erected. The bottom of the lowest cross-arm is 51 ft. 2 in. above the ground level, and the second and third cross-arms are spaced at intervals of 10 ft. The extreme top of the pole carrying a guard wire is 5 ft. 1 in. above the bottom of the highest cross-arm. The conductors are 17 ft. 1 in. from each other in a horizontal plane for the two upper cross-arms, and 18 ft. 1 in. for the lowest cross-arm, thus making all conductors 6 ft. 5 in. from the nearest part of the pole proper, measured in a horizontal direction.

The bottom of the pole at the ground level occupies a base 17 ft. square. The stub ends of the pole, *i.e.*, the portions of the pole in the ground, are separate pieces of steel, and are of such length as to allow 6 ft. for bedding in the ground.

These poles are constructed entirely of structural steel shapes, and are designed to follow the theoretical stresses and produce a pole of given strength and stiffness, with a minimum amount of material. There are a great many duplicate pieces, thus making it a simple matter for the purchaser to put them together in the field.

The pole was designed to stand the following tests : When tested in a vertical position on an immovable foundation, and with a proper margin of safety, a simultaneous horizontal side pull of 1,000 lb. at the top, and 2,500 lb. at each of the three cross-arms, or in other words, a total stress of 8,500 lb. ; the cross-arms were to support a suspended weight of 1,000 lb. at their extreme ends, and any one of the cross-arms to carry at one of these ends a horizontal pull along the line of 3,000 lb.

The receivers of Milliken Bros. (Inc.), 11, Broadway, New York City, are manufacturing these poles, at Milliken, Staten Island, New York. As all of this material (except bolts and nuts) is galvanised by the hot process before shipment, and after all the shop work has been done, there has been added to the Milliken plant a large galvanising department for doing this particular work.

The poles are all put together with bolts, and to reduce freight charges are shipped "knocked down"—in other words, all in pieces. As the illustration shows, they are stiff enough to stand being erected in one piece.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Inquirer" writes :—"I should be much obliged if you would give me your opinion on the following points :—(*a*) In sending out inquiries to sub-contractors if you word your letter somewhat after this fashion :—'We presume that you have copies of the general conditions, specifications and drawings, and we shall understand that you are quoting us in accordance with these unless you take definite exception to them'—and they send in their quotation without any reference to these matters or referring to your letter, but simply quoting you for certain plant, are they bound to accept the general conditions, &c., in the event of your offering them the work subsequently ? Of course, in the event of wishing to place the order you could insist on their acceptance, but it is conceivable that they might try to stand out for the order without the conditions (*e.g.*, terms of payment, &c.) which you as chief contractor had accepted.

"(*b*) In ordering plant from a firm if you embody a paragraph such as :—'The above plant to be delivered within——weeks under a penalty of 1 per cent. of the price for each week late in delivery'—will this protect you, even if the firm do not formally acknowledge your order but put the work in hand, thus tacitly accepting it ?

"(*c*) In (*b*) would it be necessary to avoid the use of the word 'Penalty,' saying, for example :—'The above plant to be delivered within——weeks, and in the event of your failing to do so, a sum equivalent to 1 per cent. of the price to be deducted for each week that the plant may be late by way of liquidated damages.'"

*** As to (*a*), it seems that the contract between the parties, in the event of the offer being accepted, would consist of the offer and the quotation. In that case, unless special exception was taken to the general conditions, &c., the tender would be made subject to them. It has been held in the Courts that, where an offer of this kind is made, silence on the part of the offeree will amount to a tacit admission (Greenwood *v.* Hawkings, 1906, 23 T.L.R., 72).

As to (*b*), this appears to be covered by the case above mentioned. The penalty clause can be introduced in the manner described. As to avoiding the use of the word penalty, the clause suggested may be inserted, but it will have all the legal effect of a penalty clause. According to law, the Court may relieve against a penalty, whether called liquidated damages or penalty, if the actual damage sustained can be ascertained ; but, in the present case, the damages being very uncertain, relief would probably not be granted.

Smoke Prevention.—Sir Oliver Lodge has recently been reported as stating that the proper method of burning bituminous coal is, as regards the Lancashire boiler, to burn it in furnaces lined with firebrick, thus conserving the temperature of the gases evolved from the coal by protecting them from the too early cooling effects of the surrounding water-cooled furnace plates. The principles involved in this are those we have for years, with very small effect we fear, advocated in these pages. Unfortunately, the lining of the furnace of the Lancashire boiler is a doubtful expedient, for it is very liable to damage from the tools of the fireman. It may, however, be suggested that much benefit might be derived were the lining placed behind the bridge, where it would still have a good effect, would be free from possible damage from the firing tools and would be exposed to a less severe action of the fire than it would be in the furnace. The firebrick lining has been carried out in the furnaces of water-tube boilers with good effect, and considerable improvement has been effected in these boilers by the addition of a plain over arch of brick, whereby the gases are compelled to travel over the fire surface and to mix with the air admitted at the front before they pass directly amongst the cold tubes, though a second or return arch is essential to smokelessness, for the single arch does not afford a sufficiency of mixture or temperature.

NOTES.

Telephone Rates.—On Wednesday last week the Postmaster-General received a deputation representing Chambers of Commerce and local authorities, which was formed on his initiative, as already explained. The proceedings were private.

Electric Omnibuses for Brighton.—A new London syndicate recently approached the Corporation with a proposal to run electrobuses in Brighton. It seems that the Watch Committee proposed to put such a condition on the grant of licences as would practically have stopped the scheme. This proposal has been defeated at a meeting of the Council.

Nicaraguan Rubber.—The recently-formed Atlantic Industrial Co., of Managua, will control the output of all wild rubber in the Government forests of Nicaragua. *Commercial Intelligence* says that the enterprise is a consolidation of two concessions granted by the Government as owning the rubber on the domain of the Republic, which was formerly considered the property of the individual or rubber cutter discovering and locating the trees.

Science in India.—Reuter reports that Sir Cowasji Jehanghir, a Parsee merchant, has given four lakhs of rupees for the promotion of science teaching in Bombay.

Dundee College.—The sisters of the late Lord Dean of Guild Peters have offered to the Dundee University College the sum of £4,000, for the erection and equipment of a laboratory for the practice and study of electrical engineering, in memory of their brother.

Appointments Vacant.—Assistant electrical engineer for the East Indian Railway (450 rupees to 600 rupees per calendar month) on four years' agreement; general assistant for the Bexley Council Tramways Department (35s.)

Institution and Lecture Notes.—Institution of Electrical Engineers.—On the 13th inst., a lecture on "America Revisited," was delivered by Sir W. H. Preece, F.R.S., who described his experiences during his visit to the United States in April last year, and his observations in connection with the tour. The main object of his visit was to be present at the opening of the Technical Schools of the Carnegie Institute in Pittsburg, as the guest of the founder; he was also at the opening meeting of the American Institute of Electrical Engineers in the new Engineering Societies' Building.

Royal Institution.—On Friday last Mr. Marconi delivered a lecture on "Wireless Telegraphy," which, he said, he had no doubt would soon afford better communication between distant countries than either wires or cables. Although his trans-Atlantic system had been worked only for a few hours daily, 119,945 words of Press and commercial messages had been transmitted across the ocean up to the end of February last. Wireless telegraphy was not intended to injure the cable industry; whether it would do so or not, depended on what could be done by the cables towards lowering the rates. One of the chief difficulties remaining in the way of trans-Atlantic transmission was the atmospheric trouble experienced at morning and evening, when daylight extended only part of the way across the Atlantic. In seven years, the useful range had increased from 200 to 2,500 miles.

Institute of Marine Engineers.—On Monday last week, a lecture was given by Mr. A. E. Battle, member of Council, on "Artificial Illumination, Historical and Practical," with demonstrations, and remarks upon the development of electricity as an illuminant by Mr. Holmes, of the West Ham Corporation electricity department.

Glasgow Technical College Scientific Society.—On Saturday last Mr. W. C. Mountain read a paper on "The Application of Electricity to Pumping."

Insulating Material.—A correspondent wants "insulating materials suitable for standing heavy mechanical strain, and capable of being made into bushes." We believe some thousands more are also looking for that very thing—and have been, for years and years.

Home Industries.—A correspondent suggests that the wanton placing of orders abroad for materials that can perfectly well be manufactured at home may not always be so difficult to understand as is intimated in our leader of page 425, March 13th. It is suggested that the matter will not be made any better for the home manufacturer by the new Corrupt Practices Act. And apart from mere downright corrupt practice, and the extreme facility afforded by ordering abroad, there are fostered certain tendencies in the most right-minded of men who would not touch a bribe for any consideration. There is the inducement of the trip of inspection abroad, to see the machinery in its various stages of development. In municipal work it is no secret that orders have gone abroad subsequent to such foreign visits by whole committees, the members of which would not put themselves to one-half the inconvenience by travelling to Preston, Newcastle, Walsall, or other smoke-begrimed town, even though they might there see equally excellent matters. Undoubtedly preference, on no sufficient basis, is often given to the foreigner, and this preference is by no means so shrouded in mystery as on the face of it may appear. Undoubtedly many of those who order goods abroad are subconsciously influenced by motives of self, and this without any personal pecuniary gain.

Electrical Firms and Local Labour.—The resident engineer at Dundee for the British Insulated and Helsby Cables, Ltd. (Mr. James Nelson) does not think much of the local labourer. "I would rather pay a London labourer 7d. per hour," he says, "than local labour 5½d., as I could get more work done, and at the same time be dealing with a better class of men." He adds that had it not been for Mr. Richardson's (the Corporation's engineer) keen interest in the welfare of the town he would have imported labour long ago. These remarks of Mr. Nelson's were in reply to a complaint made in the local Press that men were not taken on in connection with the excavating of the cable track unless they brought their own shovels. The true explanation, however, was that shovels were provided for the men actually required, but on account of the great number of unemployed, additional men were told they would get work provided they found their own shovels.

Robertson Social and Athletic Club.—On Saturday last the annual meeting of the two elevens representing the General Electric Co., Ltd., Witton, Birmingham, and Robertson Electric Lamps, Ltd., met on the ground of the latter at Old Oak Road, and after a good hard game, the lamp-makers were defeated by 3 to 1. After the game both teams sat down together to dinner in the Staff Dining Room at Brook Green Works, and this was followed by a fancy dress dance in the large hall, at which 350 people were present. There was a plenteous array of fancy costumes, and the final decision of the judges was as follows:—First prize, Miss A. Paine, "Britannia"; second prize, Miss Goddard, "English flower girl"; third prize, Miss Cossor, "Rags"; fourth prize, Miss C. Bailey, "Robertson Social Club." First prize, gentlemen, Mr. J. Minson, "Diver"; second prize, Mr. McInnes, "Sports and Pastimes"; third prize, Mr. Harris, "14th Century Gentleman." The prizes were presented by Mr. C. Wilson (manager), while the music was provided by Mr. Richard Scarlet's Bohemian Band. The visitors included Mr. and Mrs. C. J. Robertson, Mrs. Wilson, Mr. and Mrs. Edney, Mr. and Mrs. Seymour, &c.

Parliamentary.—London Power Bills.—The *Times* "Political Notes" column says that on the 12th inst. a meeting of the London Liberal members was held at the House of Commons, when it was resolved to oppose the message of the House of Lords that the London Electric Supply Bills should be referred to a joint committee of both Houses. "The feeling was expressed that these promotions should be dealt with by a separate committee of the House of Commons."

In the House of Commons on Tuesday, on the motion, formally made by the Chairman of Committees (Mr. Emmott, Oldham), that the House agree with the House of Lords in the resolution:—"That it is desirable that the London and District Electricity Supply Bill, the London Electric Supply Bill, and the London (Westminster and Kensington) Electric Supply Companies Bill be referred to a Joint Committee of both Houses of Parliament," Mr. Lloyd-George said that he must very reluctantly move "That the House do disagree with the Lords in the said resolution." He expressed no opinion on the merits of the Bills themselves. It would not be fair to do so, because it would prejudice the consideration of the proposals contained in them. He did not think that the method proposed was the best to investigate the merits, and especially the details, of the various propositions. As all those who had been engaged in considering the question knew, it was an extraordinarily difficult one. There had been several proposals, which were brought before the House within the last four or five years, all of them being more or less different in character, and up to the present time they had not succeeded in securing any proposal which had obtained the confidence of the House or of the Committee that inquired into those Bills. His own personal opinion was, and had been for some time, that no settlement of this very thorny and difficult question was possible without some measure of agreement between all the parties engaged. There was a general feeling that something ought to be done, and done quickly, for the purpose of supplying London with cheap electricity for power. He thought it was a scandal that something had not been done, but, unfortunately, it had become a matter of controversy between the parties as if it were a political problem, which it was not. He could not help thinking that the parties were approximating towards something like a reasonable settlement and compromise. If the Bills in question went to a Committee of the Lords, and were examined there carefully, it would give time to the parties to consider proposals which would ensure general consent. That was why it would be a mistake to precipitate a joint inquiry by the two Houses. If a Committee of this kind were set up, what would happen? The Bills would go to that Committee, who would arrive at a conclusion in regard to them in the course of the next few weeks before opinion had matured for consideration of the problem from a proper point of view. Even before a Committee of the Commons considered the question there should be a conference between the parties in order to see if there was not some general principle on which agreement might be secured. He must, therefore, reluctantly oppose the proposal that a joint committee should be set up. He did not wish it to be inferred that there was any opposition on the part of the Government to any one or other of these Bills. It was impossible that the three of them should go through, because the propositions they contained were inconsistent. He simply opposed

the Lords' proposal because he did not think that it would conduce to the object they all had in view—viz., a good and cheap supply of electricity to London. The right hon. gentleman's motion was then carried without a division.—*The Standard.*

Rochdale Corporation Bill.—Mr. Emmott's Committee of the House of Commons has passed the Rochdale Corporation Bill, which contains a clause for the construction of a small length of tramway, and a clause to enable the Corporation to supply electrical energy outside the borough. The Committee considered it desirable that all loans for the purpose of the electrical undertaking should be sanctioned under the Electric Lighting Acts, and they amended Clause 37 to secure that object. They allowed a loan of £2,500 for the construction and equipment of tramways, repayable in 30 years.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Wigan E.L. and Tramways Committee has resolved that Mr. James Slevin shall remain as electrical engineer, and have charge of the maintenance of the electrical equipment of the tramways, both underground and overhead, and of the engineering shops and the cleaning and repairing staffs at the central car-sheds.

The Gravesend T.C. has appointed Mr. H. Dildrew, of Northfleet, as E.L. canvasser.

Mr. W. W. Lackie, city electrical engineer, Glasgow, has been appointed external assessor of electrical engineering in the Glasgow and West of Scotland Technical College.

The Sutton Coldfield T.C. has unanimously decided to increase the salary of Mr. Trevor Duesbury, engineer and manager of the electricity department, by £50 per annum now, with a further increase of £50 per annum in twelve months' time.

The Stepney Borough Council has increased the salary of Mr. W. C. P. Tapper, electrical engineer and manager, from £600 per annum to a maximum of £750 per annum, the readjustment taking effect from July 24th last, on which date instructions were given him to proceed with the preparation of the Blyth's Wharf scheme. Mr. Tapper some months ago assumed, and has continued to take, the entire official responsibility for the Council's undertaking, the services of the consulting engineer (Mr. A. Wright), who was paid a salary of £800 per annum, having been dispensed with. The Council was reminded that Mr. Tapper had prepared the scheme and plans for the erection of the additional supply station at Blyth's Wharf, which have already been approved. The salary of Mr. A. J. Squire, the chief clerk in the electricity department, was increased from £200 to £210 per year, further increases by annual increments of £10 until a maximum of £250 per year is reached, being decided upon.

Tramways Officials.—The tramway employés at Halifax have presented a Doulton dinner service to Mr. F. Spencer, who recently resigned the position of tramway manager.

General.—Mr. W. F. Hemmings, formerly manager of the Lanchester Motor-Car Works, Birmingham, has been appointed to succeed Mr. J. Eaton-Shore as works manager, for Messrs. Willans & Robinson, Ltd., Rugby.

Mr. John Denham, M.I.E.E., Government electrician at Cape Town, has been appointed a Justice of the Peace for the several districts of Cape Colony.

We learn that His Majesty's Indian Government has just awarded Mr. T. Scott Anderson, of Sheffield, a diploma and gold medal for services rendered to the Government in the electrical reduction of native iron ore—and its further conversion to steel. The Government is now considering a large project for the utilisation of this iron deposit, using water as motive power. Mr. Scott Anderson is also engaged upon similar projects for the Imperial Russian Government, the New Zealand Dominion Government. Considerable quantities of ore have been treated, and the steel produced has been made up into every description of tool, &c., with, we understand, the most satisfactory results. In New Zealand large quantities of chrome ore exists, which is also being electrically smelted.

Mr. E. Garner, late of the General Electric Co., Ltd., has been appointed electrical engineer at the Great Wheal Busy Tin Mines, Chacewater, Cornwall.

On 16th inst. the staff of the Trafford Power and Light Supply (1902), Ltd., gave a dinner at the Trafford Park Hotel in honour of Mr. W. Mills, chief assistant and resident engineer of the above company, who is leaving to take up the post of superintendent engineer to Messrs. Sherman & Co., Manchester. A chiming clock, which had been subscribed for by Mr. Mills's colleagues at the power house, was presented during the evening by Mr. J. McGregor, the engineer and manager of the company.

After ten years with Messrs. Warren, Beattie & Co., Ltd., power engineers, of Middlesbrough and Newcastle-on-Tyne, Mr. E. A. Warren has resigned his post, having accepted an offer to look after the electrical department of Messrs. Issigonis Bros., Smyrna, Turkey. He invites firms to send trade catalogues (especially relating to ship lighting sets and oil engines) addressed to him at the British Post Office.

Major Boys, R.E., who was on board the *Newark Castle* on the way to Mauritius, when she struck a reef off the coast of Natal, was in charge of the G.P.O. telegraphs in the Southern and South-Eastern district for some time, and he had only quite recently left that service to proceed to Mauritius. The Major was saved, but his wife was drowned through upsetting of one of the boats.

Mr. A. C. Jennings has just taken up his duties as assistant engineer of the Egyptian Telephone Co. at Cairo. Mr. Jennings recently returned from South Africa where he was in charge of extensive telephone works for the Port Elizabeth Corporation.

At Hendon, on 12th inst., Mr. Frank Hope-Jones, M.I.E.E., was presented with the bronze medal of the Royal Humane Society for his efforts in trying to save the life of a Stock Exchange clerk who fell in while walking on the ice at the Welsh Harp on January 4th. Mr. Jones dived five times but failed to find him. The Coroner, in making the presentation, referred in justifiably enthusiastic terms to the fine and self-sacrificing action of Mr. Hope-Jones who five times dived through the opening in the ice, "a most dangerous thing to do, because if he had not come up at the same spot he would have been under the ice . . . certainly that was the most heroic act in saving life, connected with the water, that he had heard of."

Obituary.—W. O. Callender.—We regret to announce the death of Mr. William Ormiston Callender, the founder of Callender's Cable and Construction Co., Ltd., which took place at his residence in Bournemouth, on the 14th inst., at the advanced age of 81 years. Mr. Callender was born in Leith in 1827, and he settled in London in 1866, and shortly thereafter became connected with the paving industry. As manager of the Val de Travers Co., he introduced asphalt into London as a material for street paving in 1869. Subsequently, he became managing partner of the Seyssel Mines Co., and had much to do with street paving contracts in France, in Germany, in Russia, and Roumania. He was largely responsible for the introduction into Europe of asphalt from the well-known pitch lake of Trinidad. In 1879 he patented an insulating material in which Trinidad bitumen formed the chief ingredient, and this material has become widely known as a dielectric for underground mains, under the name of "vulcanised bitumen." The Callender's Bitumen Telegraph and Waterproof Co. was founded in 1882, to develop this invention. The present company, Callender's Cable and Construction Co., Ltd., is its successor, and is too well known to our readers, and the electrical industry throughout the world, to require further reference here. Mr. W. O. Callender ceased to take a part in the working management of the company's affairs in 1893, but remained an active member of the board until 1903, when he resigned his seat as director, but was appointed special director of the company. Mr. W. O. Callender has been twice married. By his first wife he had a family of ten children, and all of these, as well as his widow, survive him. The funeral took place on Tuesday, 17th inst., and the office and factory were closed for the day.

NEW COMPANIES REGISTERED.

Macclesfield Electric Lighting and Power Co., Ltd. (97,189).—This company was registered on March 11th, with a capital of £25,000 in £1 shares, to take over provisional orders and electric lighting orders, to undertake the supply of electricity for light and other purposes in the United Kingdom, to carry on the business of electricians and engineers, &c. The subscribers are:—A. V. Ward, Fernside, Eccles, engineer, 250 shares; W. P. Theermann, 268, Oxford Street, Manchester, electrical engineer, 250 shares; J. Clark, Albert House, Mossley, cotton spinner, 1 share; G. H. Park, 483, Chester Road, Old Trafford, engineer, 1 share; S. Lloyd, 28, Duchy Street, Seedley, clerk, 1 share; W. T. Pullen, 90, Kennerley Road, Stockport, managing clerk, 1 share; C. Bucknall, 291, Chester Road, Manchester, clerk, 1 share. Minimum cash subscription 10 per cent. of the shares offered to the public. The number of directors is not to be less than three or more than eight; the subscribers are to appoint the first; qualification, £250; remuneration as fixed by the company.

Helptophone Co., Ltd. (97,169).—This company was registered on March 10th, with a capital of £1,000 in £1 shares, to carry on the business of manufacturers of and dealers in all kinds of electrical and mechanical equipment and accessories used in connection with telephones and telephonic installations, &c., and to acquire from J. J. Chiswell the benefit of certain existing inventions relating to telephones. The first subscribers (each with one share) are:—J. T. Boyes, 65, Comerford Road, Brockley, S.E., secretary; E. O. Gillard, 3, Coleman Street, E.C., clerk; L. N. Holding, 21, Granville Road, Lewisham, S.E., clerk; W. J. Grinhan, 52A, Bow Lane, E.C., engraver; F. Waite, 24, Third Avenue, Manor Park, E., accountant; C. F. Court, 48, Elliott Road, Brixton, S.W., clerk; and A. Bischof, 41, Elsham Road, Kensington, W., clerk. No initial public issue. The number of directors is not to be less than five; the first are to be appointed by the subscribers. Remuneration, 5 per cent. each of the net profits per annum. R. E. Smith is the first secretary. Registered office, 42, Old Broad Street, E.C.

Hyde-Beadle Power System, Ltd. (97,170).—This company was registered on March 10th, with a capital of £500 in £1 shares (125 preference), to acquire from C. Hyde-Beadle the benefit of a certain invention relating to the transmission of power, to adopt an agreement with the said vendor, to carry out experiments for testing, utilising and improving transmission gear, and to carry on the business of mechanical and electrical engineers, manufacturers of machine automobiles and aerial motive power appliances, &c. The first subscribers (each with one share) are:—C. Hyde-Beadle, Union Bank Buildings, Southampton, engineer; Mrs. M. E. Beadle, Beverley Lodge, Southampton; Capt. H. Riall-Sankey, 25, Victoria Street, Westminster, R.E. (ret.); R. A. Smith, Palace Chambers, Westminster, civil engineer; J. P. Thompson 26, Harcourt Terrace, South Kensington, S.W., gentleman; A. Arkell-Hardwick, 7, John Street, Adelphi, W.C., motor engineer; and Mrs. A. K. Askell-Hardwick, 6A, Royal Parade, Muswell Hill, N. No initial public issue; then umber of directors is not to be less than three or more than five; the first are C. H. Beadle, Capt. H. Riall-Sankey and R. A. Smith. Registered office, Palace Chambers, Westminster, S.W.

Railway Supplies Co., Ltd. (97,067).—This company was registered on March 3rd, with a capital of £750 in £1 shares, to take over the business carried on by M. S. Jacomb-Hood and W. J. Thorn, at Palace Chambers, Westminster, as the "Railway Supplies Co." and to adopt an agreement with the said vendors. The subscribers (with one share each) are:—E. C. Irving, Inglenook, Aldermary Road, Bromley, engineer; T. W. Ford, 7, Hazelwood Road, Putney, engineer; A. Woodman, Oaklands, Goldsworth, Woking, engineer; W. J. Thorn, Mayfield, Cecil Road, Sutton, secretary; H. P. Scott, 15, Manby Grove, Stratford, E., engineer; G. Hall, Schoolhouse, Oldfield Road, Willesden, clerk; C. F. Minett, 21, Sears Street, Camberwell, S.E., clerk. No initial public issue. Table "A" mainly applies. Registered office, Palace Chambers, 9, Bridge Street, Westminster.

CITY NOTES.

Woking Electric Supply Co., Ltd.

The directors report for 1907 a total revenue of £14,136, and expenditure connected with the generation and distribution of electricity and management, £7,096, leaving a balance on the year's working of £7,040, plus £505 brought forward, making a total of £7,545. Interest on the 4½ per cent. debentures absorbs £2,066; interest on temporary loans, £460; dividend on the 6 per cent. cumulative preference shares to December 31st, 1907 (six months to June 30th, 1907, was paid in October) requires £1,623. Dividend of 5 per cent. per annum on the ordinary shares to December 31st, 1907 (six months to June was paid in October) absorbs £1,022; there is put to depreciation fund account £1,500, and after taking into account a few small items, there is a balance of £565 to carry forward. The rate of progress during the last three years has been—

	No. of consumers.	Lamps connected.	Revenue.
1905	880 ..	33,735 ..	£11,477
1906	1,003 ..	40,080 ..	£12,997
1907	1,109 ..	45,305 ..	£14,131

During the year the directors issued £1,245 4½ per cent. debenture stock, £7,455 6 per cent. cumulative preference shares and £160 ordinary shares. Owing to the rapid and continuous growth of the business, the directors are now looking towards issuing further debenture stock, preference and ordinary shares. The capital expenditure is now £105,532. During 1907, application was made to the Board of Trade for the extension of the company's area, powers being sought to include Laleham, Littleton, Thorpe, Cobham, Wisley, Ockham, Send and Ripley, and Pirbright. The application is now before Parliament unopposed.

The annual meeting takes place next Wednesday at Woking.

Salisbury Electric Light and Supply Co., Ltd.

The directors' report for 1907 shows that the company continues to make progress. The consumers have increased from 983 with 31,769 lamps connected, to 1,012 with 33,560 lamps. The generating plant has been sufficient to meet the output; and the whole of the plant is in thorough working order and capable of dealing with a considerably increased demand. The profit on the year's working, including £59 brought forward from last account, amounts to £5,332, and after paying £1,448 interest on debentures and temporary loans, an interim dividend at the rate of 4 per cent. for the half-year, amounting to £700, and writing off £125 from exhibition account, there remains a balance of £3,060. The directors recommend a further dividend at the rate of 7 per cent. for the half-year, making with the interim dividend, 5½ per cent. for the year, and that £1,500 be carried to reserve, leaving £335 to be carried forward. The directors express regret at the death of their colleague, Mr. William Marlow. Mr. C. J. Woodrow has been elected to fill the vacancy. Mr. Gripper retires by rotation, but offers himself for re-election.

The above report was adopted at the meeting held on Tuesday last week.

Statement of Electricity Generated, Sold, &c.

	1905.	1906.	1907.
Quantity generated in B.O.T. units	526,901	615,041	608,451
Units sold—Public lamps	10,200	10,200	10,200
Private consumers by meter	417,660	492,504	485,919
Total sold	427,860	502,704	496,119
Used on works	56,853	63,568	62,264
Total used	484,713	566,272	558,383
Expended in distribution	42,188	48,769	50,068
Public lamps	33	33	33
Total maximum supply demanded	296 kw.	314 kw.	316 kw.

A. B. Randall, *Resident Engineer and Manager.*

Shawinigan Water and Power Co., Ltd. — The directors have declared a dividend of 1 per cent. for the quarter ending March 31st.

Gandy Belt Manufacturing Co., Ltd.—The directors recommend a final dividend of 4½ per cent. on the ordinary shares, making 7 per cent. for the year 1907.

Guildford Electricity Supply Co., Ltd.

The directors' report for 1907 shows that the company has again made very satisfactory progress, the gross receipts being £6,467, as compared with £5,975 for 1906. The accounts show a balance on revenue account of £3,082 (after crediting depreciation fund account with £1,000), as compared with a balance of £2,668 on the revenue account for 1906, in which year £500 only was credited to depreciation fund account. After making due provision for interest on debentures, dividend on preference shares, and transferring £350 to the credit of reserve fund account, the net revenue account shows a balance of £914 for distribution. Out of this amount the directors recommend the payment of a dividend at the rate of 5 per cent. for the past year on the ordinary share capital of the company, which will absorb £693, thus leaving a balance of £220 to be carried forward to the credit of the net revenue account for the present year. The depreciation fund account has, with the above, been increased by £1,000, and the reserve fund account by £350, as compared with a sum of £500 credited to depreciation fund account, and an amount of £250 to reserve fund account for 1906, thereby materially improving the financial position of the company. The following table shows the progress of the business:—

Year.	No. of consumers.	Revenue.	Total costs.
1905 ...	473 ...	£5,374 ...	£2,782
1906 ...	525 ...	£5,975 ...	£2,524
1907 ...	588 ...	£6,467 ...	£2,534

The total capital expenditure up to December 31st last amounts to £53,271, and the total capital receipts are £49,386; there is, therefore, a balance over-expended of £3,885. The directors are very desirous of issuing further ordinary and preference shares, and also the balance of the debentures, in view of the fact that additional capital expenditure has been incurred to meet the needs of the company's increasing business, and to effect further economies in the working expenses. Mr. C. J. Scott resigned his position as a director of the company in June last, after having served in that capacity for some years. Mr. Edward E. Pullman was elected a director in March last to fill the vacancy caused by the death of Mr. E. S. Baring-Gould.

Statement of Electricity Generated, Sold, &c.

	1907.	1906.
Units sold:—Lighting	236,694	212,326
Power and heating ..	68,165	82,365
Total	304,859	294,691
H.P. of motors connected	270	200
Total number of consumers	588	525

British Insulated and Helsby Cables, Ltd.

The directors' report for 1907 shows a profit of £135,620, plus £36,713 brought forward. From this have to be deducted:—Directors' and debenture trustees' fees, and remuneration to Works Committee, less directors' fees receivable from other companies, £4,497; interest on debenture stock, £22,500; depreciation on buildings, plant, machinery, &c., £22,000; transfer to reserve account, £10,000; transfer to debenture stock redemption account, £5,000; dividend on preference shares to December 31st, 1907, £30,000; interim dividend on ordinary shares to June 30th, 1907, £20,000; leaving available for dividend a balance of £58,335. The directors recommend the payment of a further dividend of 4 per cent. on the ordinary shares, making, with the interim dividend already paid, a total of 8 per cent. for the year ended December 31st, 1907, together with a bonus of 2 per cent., £30,000; £28,335 is carried forward. The volume of trade during the past year, especially in heavy cable work, has not been so great, owing to the high price of copper in the earlier part of the year, and to the financial stringency later on, and the profits have thereby been adversely affected. It is, however, satisfactory to be able to say that the volume of business done so far this year, and orders in hand at present, compare very favourably with the corresponding period of last year. A sum of £10,000, it will be observed, has been transferred to reserve account, and a further £5,000 to debenture stock redemption account, in addition to £22,000 depreciation of buildings, plant and machinery.

Melton Mowbray Electric Co., Ltd.

At the eighth annual meeting, it was reported that the lamps connected had increased from 16,391 to 17,528, being an increase of 7 per cent. The number of consumers was now 535, and including the balance of £80 brought forward, there was a net profit of £3,014. After payment of debenture and loan interest, £1,041, writing off the last instalment of £81 in respect of exhibition expenses, and £75 depreciation and loss on wiring account, there was a balance of £816. The directors recommended a dividend at the rate of 2 per cent. per annum, which would require £400; that £400 be placed to reserve for renewal of plant, and the balance £16 carried forward.

The report was adopted.

Windermere and District Electricity Supply Co., Ltd.

The directors' report for 1907 says that the gross revenue during the year showed a satisfactory increase, and the profit from installation work is somewhat larger. The balance of the revenue account shows an improvement which would have been much greater but for the increased expenditure on coal, mainly caused by the higher price. A first payment of 2 per cent. on account of arrears of interest has been received on the Keswick Electric Co.'s

debentures, and the revenue account has benefited to the extent of £38 from this source, and the arrears of interest due from the Keswick Co. have been reduced to the extent of £151. The sum of £245 has been spent on capital account, and as foreshadowed in the last report, the increase in the business has necessitated the provision of additional machinery. The directors have therefore entered into a contract with the Brush Electrical Co., Ltd., for a compound engine and alternator of the latest type, which should be at work before the end of June. The directors anticipate that this will effect economy in working expenses, and also believe that the provision of this additional machinery will largely diminish the risk of any interruption to the service. To obviate the necessity of supplying the Keswick Co. with further capital, the directors have arranged for one of the machines now in use at Windermere to be moved to the Keswick works and lent to that company for a fixed annual payment. The balance of revenue account for the year is £2,061, to which is added interest on Keswick debentures £38, plus £18 brought forward. Debenture interest and bankers' charges absorbed £774; interim dividend of 1 per cent. on preference shares, £250; there has been transferred to depreciation reserve account £500. A further dividend of 2 per cent. (making 3 per cent. for the year) is to be paid on the preference shares, and £93 is to be carried forward.

County of London Electric Supply Co., Ltd.

The meeting was held on Monday at Winchester House, Mr. J. B. Braithwaite presiding.

The Chairman, in proposing the adoption of the report (see Electrical Review, March 13th, page 451), said that the hopes which he had held out for the last two or three years that the capital expenditure would gradually decrease was still borne out. Taking the expenditure on mains, one of the leading items in their London district, the figures for the last seven years showed a steady and continuous decrease, with the exception of one year. In 1902 they spent £74,954; 1903, £45,272; 1904, £40,893; 1905, £44,313; 1906, £31,672; and last year it was the lowest they had yet had, £23,701. Taking the entire capital expenditure on their London stations, there again they found a steady decrease going on—the figures being as follows:—1902, £143,857; 1903, £133,772; 1904, £83,505; 1905, £82,380; 1906, £67,813; and 1907, £57,669; and their engineer estimated that this year the capital expenditure would show a still further decrease. The question had been asked on two or three occasions as to whether the capital expenditure they had incurred was profitable. He had always stated that they were very careful indeed only to make capital expenditure where they saw a reasonable certainty of making a handsome profit. In 1903 their capital expenditure of £133,772, resulted in an increased profit of £11,727 or 8·7 per cent. on the capital. In 1904 the capital expenditure of £83,504 resulted in an increased profit of £19,307 or 23·1 per cent; in 1905 they spent £82,380 on capital, which resulted in an increased profit of £9,661 or 11·7 per cent.; in 1906 a capital expenditure of £67,813 resulted apparently in an increased profit of £2,908 or 4·3 per cent., but in 1906 the bulk of that capital expenditure was made towards the end of the year and so was not really reflected until 1907. In 1907 they had £57,676 capital expenditure with an increase in their profit of £12,901, representing 22·3 per cent. Taking the five years together their increased capital expenditure of £425,139 had resulted in an increased net profit of £56,504 or 13·2 per cent. Turning to the revenue account, there they had a satisfactory state of things to show. The total receipts were £175,779, an increase of £19,561. The increase in their works costs had amounted to £5,628, so that of that £19,561 they retained after paying the increased cost of coal during the year, £13,933, but against that there were certain claims to be met over which the directors had no control. As a result of the last quinquennial valuation their assessment was considerably increased, and only a portion of the extra charge came into the accounts for 1906. This past year they had had to bear the full brunt of it, and they had had to pay £911 more for rates than in the previous year. Income-tax had cost £407 more, and wages and salaries in connection with the administration of the company had increased by £920. They had written £1,311 more off suspense accounts than they did last year, raising the total figure to £3,968 written off those accounts out of revenue. Then they had written £1,409 off slot meter and rental wiring installations, and they had made £400 extra provision for bad debts, which they hoped would not be required. Those items together amounted to £5,358 reducing their extra profit by £10,575. Of that they had placed an additional £7,000 to depreciation, raising the amount contributed out of revenue from £16,000 to £23,000; they had paid £1,741 more in interest on temporary loans, and the remaining portion of the extra profit had gone in the increased preference dividend due to the issue which they made last year. It would be seen, therefore, that out of the extra profit they had made considerably more than half of it had gone to strengthening the company's position by increasing the depreciation fund and writing additional amounts off their suspense accounts. Taking the London stations by themselves, which were really the backbone of the business, the results were even more satisfactory than if they took the company as a whole, for there the increase in the revenue was £24,438, an increase of 14 per cent. Their turbine machinery continued to work exceedingly well. They had now got five Curtis turbines each of 15,000 kw. capacity in use as compared with three at the end of 1906, and that had enabled them to reduce their works costs. Their lamp connections for the year were an absolute record. They had connected the equivalent of 120,654 lamps, which was 16,603 in advance of last year's increase. In units sold the sales showed an increase of 3,214,755 units compared with an increase of 2,141,000 last year. The increase, therefore, was one of 30 per cent. in the units sold. During the year they had supplied a section of the L.C.C. tramways with 1,716,000 units as compared with 743,290 in 1906. Their new power station was now in working order, and they were taking their own power, so that they would have these 1,716,000 units available for what he might term their ordinary customers without any increased strain on their machinery. For the lighting units the total sales showed an increase of 14½ per cent. They were rather unfortunate in the December quarter, in common with other London companies, owing to the extraordinary deficiency of fogs. For power purposes they sold 7,059,714 units, and for lighting 6,910,465, so that practically they sold half for lighting and half for power, which was a very good proportion, and went some way to dissipate the widespread idea that no London supply companies did anything for the poor power-user. In the works costs they had a further decrease of 11·7 per cent. on last year's figures. The total increased expenditure for the supply of these 3 million extra units was £5,628, of which £5,420 was due to the increased cost of coal. Had coal stood at the same price as in 1906, they could have supplied those 3 million extra units at an increased cost of £208. That showed that the Curtis turbine machinery was realising the economies they expected from it. The efficiency of distribution showed an improvement of 3 per cent. on last year, and was now 75·9 per cent., which was due to the increased sales for power purposes. With regard to the lamps connected, he told them last year that he hoped they might cross the million this year, and they had just done it, for at December 3rd, they had just over 1 million lamps applied for. Their progress during the current year, so far as it had gone, was fully equal to last year—in fact, it was ahead of it. Taking the lamps applied for last year during the same period in the Northern districts, they had an equivalent of 9,293, 30-watt lamps applied for; this year they had had the equivalent of 11,866, an increase of 28 per cent. over last year's figures. In the southern district the result was more remarkable. Last year the applications up to date were 6,847, this year 11,654, an increase of 70 per cent. over last year's increase. With regard to units sold, they came out extremely well. In the Northern area they had sold 1,602,808 units, against 1,782,555 last year, showing a decrease of 10 per cent., but last year's figures included 396,916 supplied to the L.C.C. tramways; so that really as far as their own customers were concerned, there was an increase of 14 per cent. In the Southern district they had sold 1,390,701 units to date, as against 1,242,554, showing an increase of 12 per cent. during the last five years. In lamps applied for they had risen from 416,292 to 1,001,171, in units sold from 4,868,285 to 13,970,179, and the number of their customers had advanced from 4,139 to 12,483. The profits from their London stations had increased from £61,699 to £118,201, and their net revenue from all sources had risen from £57,668 to £104,154 in the same period, while at the same time the average price per unit had been reduced. In 1902 they realised 4·58d. for every unit; last year they only realised 2·83d. The Bournemouth Co. continued the even tenour of its successful way. At Coatbridge they had laid out something like £23,000 during the past year, and he was glad to say that that business seemed to be developing in a very satisfactory way. Latterly they had had a considerable increase in their power consumers. The increase at Coatbridge last year was equivalent to 29,000 30-watt lamps, which, for a little station like that, was rather remarkable. They were taking on customers at Croydon, Purley and Sanderstead in a rapid manner. Mr. Braithwaite then referred at some length to the Parliamentary position, which he said he thought had somewhat improved. It was a pure fiction to think that the existing companies if allowed could not meet all the demand for power in London, and they were introducing a Bill for that purpose to which the shareholders would be asked to give their sanction at an extraordinary meeting. Personally, he was not without hopes that the President of the Board of Trade would add one more to the many services he had already done for the cause of industry, by calling a conference of the various parties interested in the question. He firmly believed that if they could get a round table conference all the difficulties could easily be settled to the mutual satisfaction of all parties.

Mr. A. H. Sanderson seconded the motion, which was carried after some discussion.

The retiring directors and auditors having been re-elected, a resolution was passed increasing the remuneration of the directors from £2,000 to £3,000 for the current year.

Subsequently, at an extraordinary meeting, the resolution approving of the Bill to which the chairman had referred in his speech, was carried.

Davis & Timmins, Ltd.

Sir Henry Mance presided on the 13th inst. at the annual meeting, held at Winchester House, and in moving the adoption of the report, he said that in these days of commercial depression they were able to show evidence of continued prosperity and steady, though slow, progress—progress made in face of the keen competition which always followed a period of trade depression and of fluctuations of metal prices. Four things that were essential to a successful company nowadays were: A first-rate organisation, up-to-date machinery, ample working capital, and a zealous staff. As their own company possessed all these they might expect their 8 per cent., and perhaps a little more, every year. He did not say one word about the effect of Protection upon their trade. As a company they did not care for

competition either at home or abroad, but they were a sort of universal provider, and supplied many classes of business in this country with their requirements. If, therefore, our fiscal system pressed heavily upon those various businesses, it might to some extent react upon this company, but they were perfectly able to hold their own against any competition either at home or abroad. Including £6,572 brought forward, the year's profits, after allowing for depreciation and manager's commission, were £17,166. After paying the dividend already named, £7,806 was carried forward. The company would have a good exhibit at the Franco-British Exhibition. The works at Wood Green were full of work, and they had every reason to hope that 1908 would be no worse, and perhaps a little better, than preceding years.

The report was adopted.

Chelsea Electricity Supply Co., Ltd.

The annual meeting was held on Wednesday, March 11th, at Winchester House, E.C., Sir Irving Courtenay presiding.

The Chairman in moving the adoption of the report (see Electrical Review, February 28th, page 363), after referring with regret to the death of Mr. W. Page, in whose stead Mr. R. H. Beeton had been elected to a seat on the board, said that the capital expenditure was small and called for little comment. The credits in that account, and the debits in renewals fund account, were due to the replacement of some plant, mostly transformers and accumulators, by plant of an up-to-date and therefore more efficient character. The gross receipts showed an increase of £3,443, but the expenses also had increased by £2,158, making the net increase only £1,285. The increase in expenses would be found chiefly in coal, which was £1,304 more, and in rates, which were higher by £695. The higher price of coal accounted for £970, but he was happy to say there was a prospect of an early reduction in the price, though the effect of possible legislation had to be considered. He could not speak so hopefully of the rates. The total they now paid in rates, £5,843, amounted to over 45 per cent. of the amount distributed in dividend, was more than 2¼ per cent. on the ordinary shares, and equalled two-fifths of a penny per unit sold. Apart from these drawbacks, the results of the year had not been unfavourable. They were able to pay the same dividend as last year, they placed a substantial amount to the depreciation fund, and they had started small funds as a necessary provision in respect of two items which should be written off during the life of the company's provisional order. Notwithstanding the extra expenses, their works costs per unit sold were almost the same as last year, and they had increased the number of 8-c.p. lamp equivalents by 7,430, and the units sold by 240,914, making the total units sold well over 3½ millions. The balance of debtors over creditors was the same, and the cash position about £6,000 better. Very little new construction work was carried out during the year, and consequently the increase in the capital expenditure had only been small. Extensions of their distributing mains were made where necessary. In this respect they were feeling the benefit of the alteration in the voltage which they made some years ago, as most of the feeding mains had, in consequence, been of sufficient capacity to serve for the supply to an extended network of distributing mains without increasing their size or number. The state of the building trade in Chelsea had continued to be quiet throughout the year. In some parts of the area of supply old buildings had been pulled down, and the new buildings which were to take their place had not been pressed forward very actively. Some of the new houses had, however, now been let or sold, and would be producing revenue during the current year. The general character of the supply of electricity had been well maintained, and their customers had had no cause for complaint. It was a satisfaction to know that they had been free from those partial breakdowns or irregularities which had not been unknown in some other districts. In regard to the future of the business; upon this point he was not going to hazard any prophecies. There were too many uncertainties hanging over the industry for him to venture on that course. This was especially the case as regarded those companies who were operating in what he would broadly term the London area—but, at the same time, he by no means regarded them as insurmountable. In regard to the metallic filament lamps, they fully recognised that the advent of this class of lamp, which to the consumer was economical in the use of current, would make a certain disturbance in their business; but owing to the technical and other difficulties in the way of the general adoption of the lamp at present, the effect would be partial and gradual, and, he thought, should eventually be compensated for by a largely increased use of the light through the extension of its use into the cheaper class of houses and shops, and he inclined to the opinion that when the lamp became so perfected as to be capable of general adoption, it would greatly assist them in keeping ahead in the competition with gas. A majority of the London supply companies had joined hands to promote a Bill in Parliament for the purpose of supplying electricity in bulk in London and the surrounding districts. They were advised that this could be effected by the companies with far less expenditure of capital than would be the case with a new company or a central authority, and that such a supply could be commenced at once, whereas a new authority would require some years to carry out an entirely new scheme and to erect stations and plant. That being the case, they considered it right and proper that the supply should be retained by the existing companies, and that new and unfair competition should not be introduced from outside. Surely that was a reasonable position to take up. The existing companies had borne the heat and burden of the struggle as pioneers, and they said that they were entitled to fair treatment and full consideration from Parliament. They hoped to get the goodwill of the L.C.C. on behalf of their scheme, and were ready to come to any reasonable terms with that body to ensure the success of a measure which should be to the advantage of the companies generally, as well as to the people of London as a whole.

Mr. W. R. Davies seconded the motion.

The Chairman, replying to questions by shareholders, said that they had spent a great deal of money in resisting their increased assessment, but the appeal went against them. He could not promise that there would be any finality in regard to depreciation. They must remember that their order was getting older year by year, and the provision they were making for depreciation was on a strictly actuarial basis.

The report was adopted.

An extraordinary meeting was then held, at which a resolution was unanimously carried approving the Joint Bill.

Hove Electric Lighting Co., Ltd.

The annual meeting was held on Thursday, March 12th, at Salisbury House, E.C., Col. A. J. Filgate, R.E., presiding.

In moving the adoption of the report (see Electrical Review, March 6th, page 411), the Chairman said the capital expenditure during the year was £2,893, of which £585 was for land and buildings in connection with the new generating station in Leighton Road; £2,050 was spent on mains, and £264 on meters. The capital expenditure up to the end of the year amounted to £162,423. Of this £128,640 had been provided out of the several issues of shares and debentures, £18,226 from the premiums realised on shares of debentures, and £15,568 from the renewals and depreciation account. They considered it desirable to place the renewals and depreciation account on a permanent footing, and to make a commencement in this direction, with a view to replacing money expended on capital account from this fund. The amount now invested on account of the depreciation and renewals fund was £12,887. They had added 93 houses, and 6,169 8-c.p. lamps, and had sold 88,927 additional units. The gross revenue had increased by £1,696. The gross expenditure was £10,628—an increase of £1,676, which was chiefly due to an increased outlay of £922 on coal, of £439 on repairs and maintenance, and of £207 under special charges. Their coal consumption was 3,364 tons, compared with 2,888 tons in 1906, and there was a considerable advance in price. They let their contracts in the summer. The contract rate in June, 1905, was 19s. 10d. per ton; in June, 1906, 22s. 4d.; and in June, 1907, 26s. 9d. The increase in outlay on repairs and maintenance was due to the longer period during which they had been working. The net revenue amounted to £12,693, against £12,673 in 1906. Considering the adverse circumstances they had had to contend with, the result could not be considered unsatisfactory. The increase in cost of coal had similarly affected all the electric lighting companies, and they had every reason to be satisfied with the work done by Mr. C. B. Smith and his staff at Hove, and by Mr. F. R. Reeves in London. They proposed a final dividend on the ordinary shares for the last half-year at the rate of 9 per cent. per annum, making with the interim dividend 8½ per cent. for the year, and to carry the balance forward. The board regretted that they could not recommend the same dividend on the ordinary shares as had been declared in the last two years, but the conditions of their agreement with the Hove Corporation pointed to the necessity of accumulating a strong reserve fund, so as to be able to meet all contingencies that might arise during their lease and prevent a loss of capital when the lease terminated in 1934. The Board of Trade inquiry as to a proposed compulsory reduction in the rates charged for current was still uncompleted. It had to be postponed last year owing to the Board of Trade inspector, who was conducting the inquiry, being deputed to the West Indies on duty. With a view of terminating the discussion, they made a very reasonable proposal to the Hove Corporation which, however, they declined to accept, so the inquiry must go on. The board did not consider that any case could be made out for the reduction of rates now levied, without some tangible compensation. On the contrary, under present conditions, with a high price for coal, growing expenditure on maintenance, and the introduction of metallic filament lamps which gave a better light with a smaller consumption of current, it was by no means improbable that it might be necessary to enhance rates in order to obtain an adequate return on the capital invested in the undertaking. He believed it was now admitted that the special low rates for power, introduced by some electrical undertakings not long ago, had proved to be unremunerative. Their customers still continued to gradually increase, but they were no doubt suffering from the general depression in business which had prevailed for some time, and this was borne out by the number of vacant wired houses which were disconnected from the mains; these at the end of 1907 amounted to 216, against 165 at the end of 1906. An improvement in general business would probably add to their revenue, but considering the small amount of current consumed by their customers, which last year only reached, on an average, 9·76 units per 8-c.p. lamp equivalent connected, the result of the year's working could not be looked upon as unsatisfactory, and it spoke well for the care devoted to the business by the staff. The net increase in customers since January 1st this year had been 17. To show the small consumption of electricity at Hove compared with that of other systems on the South Coast, he might mention the following:—Brighton 20 units

per 8 c.p. lamp connected, Easthourne 13·3 units, Bournemouth 11·3 units, Hastings 22·4 units and Worthing 15·6 units. In each of these towns the consumption of units per lamp was considerably more than at Hove.

Col. H. Wood seconded the motion, which was adopted without discussion.

North Metropolitan Electric Power Supply Co.

The directors report that the revenue for the year 1907 was £59,373, and the expenditure £36,252, leaving a balance of £23,121. After deducting £4,000, placed to the credit of the depreciation and renewals fund, there remained £19,121 to be carried to the net revenue account, and this sum, together with sundry receipts and the amount brought forward, made up the sum of £20,505. After providing for debenture and loan interest and other charges, a dividend at the rate of 4 per cent. per annum was proposed, requiring £12,286, leaving as carry forward £386.

The name of the depreciation and reserve fund formed out of the profits for the year ended December 31st, 1906, had been changed to "depreciation and renewals fund," to meet the requirements of the Board of Trade. The capital expenditure during the year amounted to £33,416, and had now reached a total of £433,821. During the year £3 per share was called up on 25,740 shares, making these shares fully paid, and a further 10,000 shares of £10 each had been issued, upon which £5 per share had been paid. The paid-up share capital was £350,020. £126,500 5 per cent. mortgage debentures were sold in July, 1907, being part of a total authorised amount not to exceed one-third of the share capital for the time being actually issued upon which one-half has been paid up. At December 31st last £78,100 had been received in respect of such sales. The total number of units sold during the year amounted to 11,183,316, which, compared with the previous year's figure of 7,999,367, was an increase of 3,183,949 units (approximately 40 per cent.).

The North Metropolitan Electric Power Supply Act, 1907, received the Royal assent on August 2nd, 1907.

A supply of electrical energy was commenced under the Edmonton Electric Lighting Order, 1902, on July 1st, 1907, and under the Tottenham Electric Lighting Order, 1902, on December 1st, 1907.

An agreement having been entered into with the Corporation of the city of St. Albans for the incineration of the city's refuse, the erection of a generating station and refuse destructor is proceeding at St. Albans for this purpose, and also to enable the company to give a supply of electrical energy in bulk under the St. Albans Electric Lighting Order, 1898.

The company has joined the British Electrical Federation, which has been formed by various electric traction and lighting companies for the purpose of co-operation and joint action in matters of common interest.

The company's investment in the North Metropolitan Electrical Power Distribution Co., Ltd., had during the year been increased to £47,070, upon which a dividend of 2 per cent. would be received, calculated from the date of payment.

The meeting is to be held on the 24th inst.

Folkestone Electricity Supply Co., Ltd.

The directors' report for 1907 states that the company continues to make satisfactory progress. The equivalent of 8-c.p. lamps has been increased from 86,871 to 96,300. Including the receipts from hired installations, the profit on the revenue accounts for the three undertakings amounts to £12,872. This amount, with £306 brought forward, and after allowing for interest on debenture stock, dividend on preference shares and bank charges, &c., and also for the interim dividend at the rate of 4 per cent. per annum paid on the ordinary shares, shows a balance of £5,513. £3,081 has been carried to the depreciation fund, allocated to the various districts as follows, viz.: Folkestone £2,581, Hythe £400, and Sandgate £100; and also the sum of £350 to the reserve fund, which is now £2,350. The directors recommend a dividend at the rate of 7 per cent. (less income-tax) for the half-year (making 5½ per cent. for the year), which will require £1,750, leaving a balance of £333 to carry forward. The report refers to the loss sustained by the company through the death of Mr. Alderman Baker, who was one of the pioneers of electric lighting in Folkestone, and had been associated with the company since its incorporation. Mr. Councillor Wampach had been appointed to fill the vacant seat on the board.

Statement of Electricity Generated, Sold, &c.

Units generated	1,520,000
Quantity sold:—Public lamps	68,495
By contract	331,343
Private consumers by meter	850,682
Total sold	1,270,520
Used on works	26,500
Total accounted for	1,297,020
Not accounted for..	222,980
Public lamps .. .. 88 arcs, 433 Nernsts and incandescents	
Total maximum supply demanded	1,090 kw.

Oxford Electric Co., Ltd.

At the annual meeting on 6th inst. at Oxford, Sir Henry Mance, the chairman, in moving the adoption of the report (see Electrical Review, February 28th), after making brief reference to the accounts, said that at present they did not see the necessity for raising fresh capital. The tramway supply might be required more quickly than they anticipated. Reference was then made to the plant that had been added during the past year. The hire-purchase system had continued to give satisfactory results, 81 customers who brought on 2,300 8-c.p. lamps having availed themselves of it. Their total capital expenditure was about £9,000 in excess of money received from shareholders, that amount having been taken from reserve. There had been a considerable increase in cost of coal during the year; he trusted that before they met again the price would have gone down to a reasonable figure. They had had no repairs involving heavy expenditure during the year. Sale of current by meter increased by £1,306, or about 6 per cent. The increase in current actually metered was about 12 per cent., the difference being due to the allowance of discounts to large consumers, and the cheaper motive power supply. Their engineering staff had been fully occupied as usual. They had erected an engine of 300 kw. Of course, the tendency of all companies was to increase the size of their units. They had also put down a 500-kw. alternator and high-tension switchboards. All the switchboards which were erected 16 years ago had been carefully overhauled and re-modelled, in order to comply with the regulations of the Home Office. Their engineer had been carefully experimenting to ascertain if they could use a cheaper kind of coal, and, although they were not yet in a position to speak decisively, they believed that the results obtained would be satisfactory; and supposing coal still remained at the present high figure, they would be able by these means to effect a substantial reduction next year. Their earlier boilers, some of which had now been working 15 years, had been thoroughly overhauled, and were periodically passed by the inspectors. Warneford Asylum had been connected up, and a sub-station had been erected on their grounds, and motor-converters had been installed in two of the sub-stations. Considerable expense had been incurred to lay feeder cables to the North of Oxford, in order to regulate the pressure in that part of the city. Notwithstanding the increased price of coal, the cost of producing current had been reduced during the year by a small decimal. They had an equivalent of 91,000 8-c.p. lamps, an increase of 10,653 8-c.p. lamps during the year; this was undoubtedly a record. If they took from it the estimated amount of current supplied for purely power purposes, the number of lamps added to the system during the year was more than during any previous year. A few years ago they anticipated that the number of lamps added every year would decrease, but it had shown no sign of diminution up to the present; on the contrary, the tendency was to increase. In regard to metallic filament lamps, he did not regard them with any uneasiness at all; in fact, he thought they would be their best friend. They did for them what the incandescent mantle did for the gaslight; they would tend to make electric light not only cheaper but more popular, and, he believed, would educate the public up to desiring to have more light in their houses. Their system was favourable to the use of these lamps, and if they, after careful trial, continued to give good results, a large number of them would be used. If the lamps took less current, they could afford to install more lamps with the same amount of machinery, and might not find it necessary to increase their capital expenditure in future years to the same extent as in the past. He was well convinced now that even if there] should be a slight set-back it would be only temporary.

The report was adopted.

Prospectuses.—*The United Sumatra Rubber Estates, Ltd.*—This company has this week been offering an issue of 65,000 £1 shares for subscription at par. The company will acquire the Bangoen Poerba Estate, at Serdang, whereon are already planted 146,659 Para rubber trees.

Charing Cross, West End and City Electricity Supply Co., Ltd.—From full information published in our advertisement pages to-day, it will be observed that this company is offering for subscription an issue of £600,000 4½ per cent. debenture stock at 98 per cent. The proceeds will be applied from time to time in acquiring all or any of the £337,000 5 per cent. Bonds falling due in January next, also in payment of £123,000 temporary loans, and for the general purposes of the "City" undertaking.

Lanarkshire Tramways Co.—An extraordinary general meeting was called for Wednesday, 18th inst., to authorise the exercise of the borrowing powers conferred upon the company by the Lanarkshire Tramways Order, 1903.

Bastian Meter Co., Ltd.—The report for the six months ended December 31st, 1907, shows that during that period a net profit of £552 was earned. This sum, added to £534 brought forward, made a total of £1,086, and it is proposed to deal with this amount as follows:—It is proposed to pay 2½ years' 6 per cent. cumulative preference dividend to December 31st, 1907, requiring £302, and to pay a dividend at the rate of 2½ per cent. on the ordinary shares, absorbing £248, leaving £537 to be carried forward. The business of the company is being well maintained, and, the report says, there is every reason to believe that the year 1908 will prove a profitable one.

The annual meeting was held on 12th inst., when the report was adopted.

Rosario Electric Co., Ltd.—The directors have declared a dividend of 3s. per share (less tax) on the ordinary shares.

Huelva Gas and Electricity Co., Ltd.—The report for 1907 states that the net profit for the year amounted to £3,222, plus £151 brought forward, making £3,373. The annual meeting was held in Glasgow on Tuesday. A dividend of 4 per cent., free of income-tax, is recommended.

MARKET QUOTATIONS.

Wednesday, March 18th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	per cwt.	22/-	..
a ,, Oxalic	per cwt.	38/-	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac, Sal	per cwt.	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
,, ,,	per ton	£30	..
Bleaching powder	per ton	£5 10	..
a Bisulphide of Carbon	per ton	£18	..
a Borax	per ton	£16	..
a Copper Sulphate	per ton	£24	..
a Lead, Nitrate	per ton	£31	..
a ,, White Sugar	per ton	£27	..
a ,, Peroxide	per ton	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Perchlorate	per lb.	9d.	..
a Potassium Cyanide	per lb.	7d.	..
a Shellac	per cwt.	125/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	per ton	£6 10	..
a ,, Recovered	per ton	£5 10	..
a ,, Lump	per ton	£5	..
a Soda, Caustic (white 70 %)	per ton	£10 15	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a ,, Cyanide (basis 100 %)	per lb.	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£106 5	..
b ,, Wire, in ton lots	per ton	£140	..
b ,, Sheet, in ton lots	per ton	£138	..
a Babbist's metal ingots	per ton	£50 to £130	..
c Brass (rolled metal 2" to 12") basis	per lb.	6⅝d.	¼d. inc.
c ,, Tube (brazed)	per lb.	9d.	..
c ,, ,, (solid drawn)	per lb.	8d.	..
c ,, Wire, basis	per lb.	6¾d.	¼d. inc.
c Copper Tubes (brazed)	per lb.	10d.	..
c ,, ,, (solid drawn)	per lb.	10d.	..
g Copper Bars (best selected)	per ton	£75	£2 dec.
g Copper Sheet	per ton	£75	£2 dec.
g ,, Rod	per ton	£75	£2 dec.
c ,, (Electrolytic) Bars	per ton	£62	£1 inc.
c ,, ,, Sheets	per ton	£78	£1 inc.
c ,, ,, Rod	per ton	£67 10	£1 inc.
c ,, ,, H.C. Wire	per lb.	8d.	¼d. inc.
f Ebonite Rod	per lb.	3/3	..
f ,, Sheet	per lb.	3/-	..
n German Silver Wire	per lb.	1/7	..
h Gutta-percha, fine	per lb.	5/6 to 6/6	..
h India-rubber, Para fine	per lb.	8/4	inc.
i Iron Pig (Cleveland warrants)	per ton	51/6	5d. inc.
l ,, Wire, galv. No. 8, P.O.qual.	per ton	£14 15	..
g Lead, English Ingot	per ton	£14 5 to £14 10	5/- inc.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 4 to £8 5	dec.
d Mica (in original cases) small	per lb.	6d. to 1/-	..
d ,, ,, ,, medium	per lb.	2/6 to 4/-	..
d ,, ,, ,, large	per lb.	4/6 to 8/6	..
p Phosphor Bronze, plain castings	per lb.	1/1 to 1/2	..
p ,, rolled bars & rods	per lb.	1/2 to 1/3	..
p ,, ,, strip & sheet	per lb.	1/2½ to 1/5	..
o Platinum	per oz.	110/-	..
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel, Magnet, in bars	per ton	£60	..
g Tin, Block (English)	per ton	£138 to £140	inc.
n ,, Wire, Nos. 1 to 16	per lb.	1/10	1d. inc.
p White Anti-friction Metals—			
"White Ant" brand	per ton	£34 to £58	..
k Zinc, Sh't (Vieille Montagne bnd.)	per ton	£25 10	..

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Austria.—The Allgemeine Oesterreichische Electricitats Gesellschaft, of Vienna, reports a profit of 1,227,758 crowns for the last financial year, and is declaring a dividend of 6½ per cent., as compared with 7 per cent. in the preceding 12 months.

Switzerland.—La Société Suisse pour l'Industrie Electrique, of Basle, is declaring a dividend of 7 per cent. for the last financial year, the same as in the preceding 12 months.

Bournemouth and Poole Electricity Supply Co., Ltd.—The report for 1907 shows a capital expenditure for the year of £31,030. A final dividend is declared on the 15,000 ordinary shares for the half-year ended December 31st, 1907, at the rate of 9 per cent. per annum, less income-tax, leaving £938 to be carried forward.

STOCKS AND SHARES.

Tuesday Evening.

Markets continue somewhat tame and uninteresting. Cheaper money, as a benevolent factor, is counterbalanced by the stream of new issues of every kind which is making its appearance. The principal contribution to this, from the electrical point of view, is the Newcastle-on-Tyne Electric Supply prospectus, particulars of which were given here last week. It is understood that the issue received reasonable public support.

Central London stocks have developed further weakness as regards the Ordinary and the Deferred, while City and South London Ordinary receded a point. The market for Home Railway issues is in a parlous condition, and unsupported by scarcely any demand except on behalf of bears who have sold short. Stocks in the Trade lines are depressed, and not much hope is reposed in the coming Board of Trade Commission of inquiry into the whole question of railway working.

Great Northern and City Railway Preferred shares are flatter than ever at 25s. Metropolitan dropped ½, and District stock is steady.

Of the prior-charge securities, it is of melancholy interest to observe that Central London 4 per cent. Debenture stock changed hands on Monday last at par. There is rather less than a million pounds authorised of this stock, of which £871,536 has been issued. Interest is due on the fifteenth of January and July. City and South London 4 per cent. Debenture, of which there is £610,272 issued, can be bought about 102, the interest being payable on the first of May and November. The latter company's 5 per cent. Preference stocks range in value from 107 to 115, according to the year in which each of the four securities was issued. Central London, of course, has no Preference stock.

Mention of the Central London serves as a reminder that the London Road Car Company has just issued a lamentable report. The £6 shares are down to 30s., while the £100 London General Omnibus stock stands at 25, and Vanguards £1 Preference shares are 3s. 9d.

British Electric Traction Preference follow their regular track, and the price is 2s. 6d. lower. British Westinghouse Debenture has rallied a couple of points, but British Thomson-Houston Debenture stock lost 1, after its brief advance. Traction varieties are extremely quiet. Anglo-Argentine Tramways Second Preference dropped 2s. 6d., while the Belgrano quintet did not alter. Calcutta Trams remained at 7, but Calcutta Electricity Supply shares, by the way, rose to 7, a 2s. 6d. improvement, upon one or two buyers coming in and finding the market ill-supplied with shares.

Auckland Debenture and British Columbia Preferred are both a point higher. Bath Preferred shares slipped back ½ to 12s. 6d.

Telegraph stocks and shares are so idle, that there is practically nothing to say about them. Even the Anglo-American group is quiet. The Ordinary gave way slightly, but the Deferred, after showing weakness, regained its loss. West Coast of America shares are again better, and this completes the tale of alterations.

Both the Mackay stocks are *ex* 1 per cent. dividend; the quotations have been left at 60½ and 64 for Common and Preferred respectively. There is no change in Globe Telegraph and Trust shares.

National Telephone Deferred and 4 per cent. Debenture have been in slight demand, and each price displays a small improvement.

More than a dozen shares in the electricity supply list were quoted *ex* dividend last week, and allowing for this, the catalogue presents no fluctuations of importance. Charing Cross, City Undertaking Preference have lost their previous little improvements, but the South London advance is continued, and London Electric Preference are better. Newcastle-on-Tyne shares, now quoted *ex* dividend, have not been affected by the new issues. Chelsea shares went back to 3¼, *ex* their 2s. 6d. dividend, but rallied ¼ later on. Notting Hill shares have improved. At Monday's meeting of the County of London Company the chairman, Mr. J. B. Braithwaite, expressed himself as not without hope that the President of the Board of Trade would take the initiative in calling a meeting of all parties concerned in the supply of electrical power to the metropolis.

Amongst the manufacturing shares, Telegraph Constructions at 32 are 30s. lower, a seller of a few shares suffering to depress the price to this extent in a lifeless market. India-rubber shares hardened 10s., and Henley's ordinary, *ex* 10s., show a 25s. fall at 11. Here, again, the movement owes its extent to the limited nature of the market, and the inability for the time being of a very retail number of shares to find a home. Cromptons at 1⅞ have receded.

Amongst coming new issues may be mentioned about £600,000 of Charing Cross 4½ per cent Debenture stock at 98, secured as a floating charge upon the City undertaking. [Since this was written the prospectus has been issued, and it appears on another page.] The British Westinghouse 6 per cent. prior-lien Debenture issue may be out shortly, and the price is already said to have been fixed at 98, but subject to alteration before the prospectus appears.

Bank Rate.—The bank rate was yesterday reduced to 3 per cent.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations Mar. 10th.	Closing Quotations Mar. 17th.	Business done week ended Mar. 17th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2 — 3	2 — 3	..	..	..	Nil
143,800	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	..	84 — 87	84 — 87	..	..	..	5 14 11
551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	7½%	8 %	..	110 —114	110 —114	..	..	..	7 0 4
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	..	86 — 88	85 — 87	..	..	—1	4 12 0
622,600	Anglo-American Telegraph	Stock	2¾%	3½%	3¾%	3¼%	54 — 57	54 — 57	..	..	..	6 2 10
3,188,700	Do. do. do. 6 % Pref.	Stock	5½%	6 %	6 %	6 %	98 —100	98 —100	99	98½	..	6 0 0
3,188,700	Do. do. do. Deferred	Stock	Nil	½%	1¾%	1 %	13½— 14	13½— 14	13¾	13½	..	7 2 10
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	98½—101½	98½—101½	..	..	..	4 18 6
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7 — 7½	7 — 7½	..	..	..	5 6 8
2,800,459	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	..	87 — 90	87 — 90	87½	..	..	4 8 11
16,000	Cuba Telegraph	10	5 %	5 %	5 %	..	7 — 8	7 — 8	7½	7⅛	..	6 5 0
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	..	16 — 17	16 — 17	16⅛	..	..	5 17 8
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3½— 3¾	3½— 3¾	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	..	8¼— 9½	8¼— 9½	..	..	..	5 5 3
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	..	99½—102½	99½—102½	..	..	..	8 15 8
60,710	Direct United States Cable	20	3½%	4½%	4½%	..	13⅝— 14¼	13⅝— 14¼	14	..	..	6 11 0
53,700	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	..	99 —101	99 —101	100½	100	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	..	130 —135	130 —135	133	130½	..	5 3 8
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	..	83 — 86	83 — 86	84⅜	..	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	..	100 —103	100 —103	102½	101½	..	3 17 8
300,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	12¾— 13½	12¾— 13½	13	..	..	5 5 8
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 6
286,800	East & S. Afric. Tel., 4 % Mt. Db., 1 to 3,000, red. 1909	100	4 %	4 %	4 %	4 %	98 —101	98 —101	98	..	..	3 19 3
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	..	99 —101	99 —101	..	..	..	15 17 0
161,127	Globe Telegraph and Trust	10	5⅜%	5½%	5½%	..	9¾— 10½	9¾— 10½	10⅛	9¾	..	5 7 4
161,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	13⅜— 14⅛	13⅜— 14⅛	14⅛	13⅛	..	4 4 11
150,000	Great Northern Telegraph, of Copenhagen	10	24 %	24%	20 %	..	31 — 33	31 — 33	33	..	..	6 1 3
24,300	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	..	99 —101	99 —101	..	..	..	4 9 1
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	54 — 57	54 — 57	..	..	..	6 11 7
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	..	58 — 63	58 — 63	..	..	..	5 11 1
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	..	61 — 67	61 — 67	..	..	..	5 19 5
384,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅜— ⅝	⅜— ⅝	10/-	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	20/-	19/9	..	4 14 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	¾— 1	¾— 1	..	..	..	5 0 0
2,235,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107 —109	106½—108½	108½	107	— ½	5 10 7
2,341,425	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	107 —109	108 —110	109	108	+1	5 9 1
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10 — 12	10 — 12	..	..	..	5 0 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	5 %	5 %	10 — 12	10 — 12	10½⅜	10⅜	..	4 8 11
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅜— 5⅝	5⅜— 5⅝	5½	..	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	97 — 99	97 — 99	..	..	..	3 11 1
1,710,698	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100½—102½	101 —103	101⅞	101⅜	+ ½	3 17 8
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	5 12 0
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	..	1⅜— 1⅝	1⅜— 1⅝	..	..	..	4 18 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	..	90 — 93	90 — 93	..	..	..	4 6 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	..	98 —101	98 —101	..	..	..	3 19 3
11,839	Reuter's	8	5 %	5 %	5 %	..	7½— 8½	7½— 8½	7⅞	..	..	4 19 3
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	..	99 —102	99 —102	..	..	..	4 8 3
3,167	Submarine Cables Trust	Cert.	6 %	6 %	6 %	..	127 —130	127 —130	127½	..	..	4 12 4
100,000	United River Plate Telephone	5	6 %	6 %	6 %	..	6¾— 7	6 — 6½	..	..	— ½	6 3 1
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	8 %	8 %	8 %	..	4¾— 5¼	4¾— 5¼	..	..	..	4 15 3
40,000	West African Telegraph, Shares	10	4½%	4 %	4 %	..	10 — 10½	10 — 10½	..	..	..	3 16 2
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2	Nil	Nil	2½%	..	1⅜— 1⅝	1⅜— 1⅝	..	..	+ 1/16	2 13 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	..	98 — 101	98 —101	..	..	..	3 19 3
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930 ..	10	7 %	7 %	7 %	..	13½—13⅝	13¼— 13⅜	13½	13⅜	..	5 1 10
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	..	98½—101½	98½—101½	100¼	99½	..	3 19 3
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	..	⅛— ¾	⅛— ¾	..	..	..	Nil
34,568	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	..	8 — 8½	8 — 8½	8⅝	..	..	9 8 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	..	8 — 8½	8 — 8½	..	..	..	Nil
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —103	100 —103	..	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	..	8¼— 8⅜	8 — 8⅛	8⅛	..	..	4 15 6
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5¾%	5¾%	5¾%	..	— 6½	6 — 6½	6⅝	6	..	4 8 0
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	..	129 —132	129 —132	..	..	..	4 10 11
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	..	103 —106	104 —107	..	..	+1	4 13 6
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	..	3¼— 3⅜	3¼— 3⅜	70/4½	74/4½	..	5 3 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	3⅞— 4¼	4⅛— 4⅜	..	..	..	7 15 7
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	4⅜— 4⅝	4⅜— 4⅝	..	..	..	7 3 7
20,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	..	4¼— 5⅛	4⅜— 5⅝	5 5/32	..	..	5 11 1
20,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	..	3¾— 4¼	3¾— 4¼	..	..	..	4 14 1
238,200	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	..	100 —103	100 —103	..	..	..	5 13 5
800,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	98½	..	..	5 10 0
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	..	127 —130	127 —130	..	..	..	4 12 4
800,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	..	106 —110	107 —111	109½	109	+1	4 10 11
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	..	104 —108	105 —109	..	..	+1	4 11 9
285,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	..	101 —104	101 —104	..	..	..	4 6 7
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	..	100 —103	100 —103	..	..	..	4 7 5
133,301	British Electric Traction	10	6 %	3 %	Nil	..	1¼— 1⅜	1¼— 1⅜	31/3	28/9	..	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	..	4¼— 4⅜	4¼— 4⅜	33/9	35/-	— ⅛	12 19 6
1,448,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	..	97 —100	97 —100	99	..	..	5 0 0
410,178	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	..	72 — 76	72 — 76	..	..	..	5 18 5
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	..	6⅝— 7⅛	6⅝— 7⅛	..	..	..	7 0 4
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	5⅝— 6⅛	5⅝— 6⅛	..	..	..	4 18 0
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
212,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	..	85 — 89	85 — 89	87	..	..	5 3 6
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅛— ⅞	⅛— ⅞	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	43 — 48	45 — 50	..	..	+2	8 0 0
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	Nil	2½%	Nil	..	0— ¼	0 — ¼	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	..	⅛— ⅜	⅛— ⅜	..	..	..	5 12 6
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	77 — 80	77 — 80	..	..	..	6 16 4
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	..	63 — 66	63 — 66	..	..	..	9 1 6
100,000	Buenos Ayres & Belgrano, 1 to 100,000	5	4 %	3 %	3 %	..	4⅜— 4¾	4⅜— 4¾	..	..	..	5 17 1
40,000	Do. do. "A" 6 % Cum. Pref., 1 to 40,000	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛	..	..	..	5 17 1
27,500	Do. do. "B" do., 1 to 27,500	5	6 %	6 %	6 %	6 %	4⅜— 5⅛	4⅜— 5⅛	..	..	..	4 6 2
810,000	Do. do. 5 % Deb. Stock	100	5 %	5 %	5 %	5 %	110 —116	110 —116	..	..	..	4 15 8
190,000	Do. do. 5 % 2nd Deb. Stock	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	5 8 6
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	8 %	..	6⅜— 7⅛	6⅜— 7⅛	7⅛	..	..	4 13 0
30,000	Do. 5 % Cum. Pref., Nos. 1 to 29,830..	5	..	5 %	5 %	..	5 — 5⅜	5 — 5⅜	5 1/16	5½	..	4 5 9
850,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	..	101 —105	101 —105	..	..	..	5 7 8
85,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	..	10⅜— 11⅜	10⅜— 11⅜	11⅛	10 1/16	..	4 5 11
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅜— 5⅝	5⅜— 5⅝	..	..	..	4 4 1
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	..	106 —108	106 —108	..	..	..	Nil
491,222	Cape E Trams., 1 to 491,222	1	5 %	Nil	Nil	..	1/16— 1/8	1/16— 1/8	4/4½	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	..	1⅛— 1⅜	1⅛— 1⅜	26/9	26/3	..	5 16 4
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
1,898,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	64 — 67	63 — 66	64⅛	..	—1	4 10 11
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	82 — 84	82 — 84	82½	..	..	4 15 3
553,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	43 — 46	42 — 45	42⅜	42½	—1	4 8 11
1,480,000	City and South London Railway	Stock	2½%	1¾%	2¼%	2¼%	38 — 40	37 — 39	37⅝	..	—1	5 9 0

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations Mar. 10th.	Closing Quotations Mar. 17th.	Business done week ended Mar. 17th, 1908. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	£	2½%	2½%	5 %	..	1⅛— 2⅛	1¾— 2	..	..	— ⅛	7 10 11
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	..	92 — 95	92 — 95	..	..	..	5 5 3
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	..	1⅛— 1⅜	1⅛— 1⅜	..	..	..	7 5 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	..	1⅛— 1⅛	1⅛— 1⅛	..	..	..	5 3 3
282,580	Do. dc. 4½ % Deb. Stock	100	4½%	4½%	4½%	..	99 —102	99 —102	101¾	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6½%	12½— 13½	12½— 13½	..	..	..	4 18 2
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½— 13½	12½— 13½	12½	..	..	4 7 3
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	2½%	4½%	4½%	..	⅜— 1	⅜— 1	..	..	..	12 10 0
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	..	1½— 2½	1½— 2½	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	..	78 — 81	78 — 81	..	..	..	4 18 9
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	87 — 90	87 — 90	..	..	..	5 11 1
112,100	Electric Contruction, 1 to 112,100	2	Nil	Nil	Nil	..	⅛— ¼	⅛— ¼	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	Nil	..	1½— 1⅝	1½— 1⅝	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7⅞— 8⅛	7⅞— 8⅛	..	..	..	6 1 3
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	..	89 — 92	89 — 92	..	..	..	4 19 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	..	1½— 1⅝	1 — 1⅛	..	..	— ½	20 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½— 10⅝	10½— 10⅝	..	..	..	6 10 0
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	..	102 —103	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15%	15 %	15%	11⅜— 12⅜	10½— 11½ xd	..	..	..	7 8 1
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	4½— 5⅛	4½— 5⅛ xd	..	..	..	8 17 3
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	5 %	10%	10 %	..	15½— 16½	15½— 16½	16⅛	..	+ ½	6 1 3
37,500	‡Liverpool Overhead Railway, Ord.	10	1½%	Nil	Nil	½%	1⅜— 1⅝	1⅜— 1⅝	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	6⅜— 6⅝	5 — 5⅛	..	..	—1⅜	9 1 10
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	3 %	3 %	..	6¼— 6⅜	6¼— 6⅜	..	..	..	4 8 11
399,930	Do. do. 60,008 to 100,000	10	6 %	3 %	3 %	..	6¼— 6⅜	6¼— 6⅜	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	..	7⅛— 8	7⅛— 8	..	..	..	5 17 6
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	..	82 — 86	82 — 86	83	..	..	4 18 0
5,732,062	Metropolitan Consolidated	100	3 %	2½%	1 %	..	35½— 36½	35 — 36	36¼	35½	— ½	1 7 9
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	66 — 68	66 — 68	67½	66½	..	4 0 11
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	9½— 10⅛	9½— 10⅛	10⅛	..	..	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	⅛— ⅜	⅛— ⅜	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	29/32— 31/32	29/32— 31/32	..	..	..	5 11 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	97 — 99	97 — 99	..	..	..	4 10 11
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	..	¼— ⅜	¼— ⅜	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	⅜— ½	⅜— ½	10/9	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 18 9
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	32½— 34½	31 — 33	31	..	—1½	7 15 7
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	8 17 8
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	..	40 — 44	40 — 44	43¼	43	..	11 7 4
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	5 %§	1 — 1⅛	1 — 1⅛	..	..	..	6 13 4
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	3½— 3¾	3¼— 3¾	..	..	..	0 3
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	73 — 77	73 — 77	..	..	..	5 1 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P,. 1 to 15,000	5	5⅛%	5⅛%	5⅛%	..	4⅝— 5⅛	4⅝— 5⅛	..	..	..	5 7 4
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	..	95 — 98	96 — 99	..	..	+1	4 10 11
30,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10%	10 %	7⅞— 8⅛	7⅞— 8⅛ xd	..	..	..	5 17 8
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7 — 8	6⅞— 7⅞ xd	..	..	..	4 10 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	97 —100	98 — 101	..	..	+1	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	4¼— 4⅝	4⅛— 4⅝ xd	..	..	..	5 8 1
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4¼— 4⅝	4¼— 4⅝	91/3	..	..	4 14
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	4⅜— 4⅝	4¼— 4⅝	91/3	..	..	4 14 9
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	97 —100	96 — 99	96½	..	—1	4 0 10
49,436	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	..	3⅝— 4⅛	3¼— 3⅝	..	..	— ½	6 4 2
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	..	101 —104	101 —104	..	..	..	4 6 7
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10 — 11	10 — 11	10½	10½	..	9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½— 12½	11½— 12½	..	..	..	4 16
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103	101 —104	101¼	..	+1	4 6 7
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	..	3 — 3⅜	3 — 3⅜ xd	..	..	..	5 6 8
50,000	Do. do. 5 % Pref.	5	5 %	5 %	5 %	..	4⅜— 4⅝	4¼ — 4¾ xd	..	..	..	5 5 3
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7⅜— 8⅛	7⅜— 8⅛	8	7⅞	..	6 3 1
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	11 — 11½	11 — 11½	11⅞	..	..	5 4 4
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	..	..	..	5 7 10
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	97 —100	97 — 100	..	..	..	4 10 0
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	..	⅛— ⅜	⅛— ⅜	2/6	..	..	11 0 0
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	..	1 — 1¼	1 — 1¼	..	..	..	12 0 1
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	..	60 — 70	60 — 70	62	61	..	6 8 7
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4⅝— 5⅛	4⅝— 5⅛	..	..	..	5 7 4
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	..	94 — 97	94 — 97	..	..	..	4 12 9
15,000	Hove, 1 to 13,000	5	8½%	9 %	9 %	..	6½— 6⅝	6⅜— 6⅝	6⅝	..	..	6 13 4
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	..	8 — 9	7⅜— 8⅜ xd	..	..	..	5 14 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 0 10
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	1⅛— 1⅜	1⅛— 1⅜ xd	..	..	..	4 13 0
70,000	Do. do. do. 6 % Pref.	5	6 %	6 %	6 %	6 %	4½— 5	4½— 5	..	..	..	6 0 0
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	90 — 93	90 — 93	..	..	..	4 16 9
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	5½— 5⅝	5 — 5⅛ xd	5⅛	..	..	6 8 9
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅝— 5⅛	4⅝— 5⅛	..	..	..	3 18 3
220,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	107 —111	107 —111	..	..	..	4 1 1
250,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	85 — 90	85 — 90	..	..	..	3 17 9
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	..	97 —100	97 —100	..	..	..	4 10 0
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	..	6⅝— 6⅞	6⅝— 6⅞ xd	..	..	..	6 5 6
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5⅛— 5⅜	5⅛— 5⅜	..	..	..	4 10 11
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	11 — 12	11½— 12½ xd	11⅝	11	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5½— 6⅛	5⅝— 6 xd	..	..	..	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	93 — 95	93 — 95	..	..	..	5 17 6
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7½— 8⅛	7½— 8⅛	8⅛	8	..	5 14 3
20,000	Do. do. 7 % Pref. 20,061 to 40,060	5	7 %	7 %	7 %	7 %	6¾— 7	6¾— 7	..	..	..	5 0 0
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	85 — 90	85 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅝— 1⅛	⅝— 1⅛	..	..	..	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	70 — 74	70 — 74	..	..	..	5 8 1
66,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	..	2½— 3	2⅝— 3⅛	..	..	+ ⅛	4 16 0
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅞— ⅞	⅞— ⅞	..	..	..	3 6 8
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅜— 1⅝	1⅜— 1⅝	..	..	..	5 1 10
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	1½— 2½	1½— 2½	..	..	..	12 10 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	2 — 2½	2 — 2½	..	..	..	10 0 0
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	..	90 — 95	89 — 93	..	..	— ½	4 16 9
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅞— 8⅜	7⅞— 8⅜	..	..	..	5 14 3
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	5 — 5⅛	5 — 5⅛	5	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. § Interim Dividend.

Bank rate of Discount 3½ per cent., March 5th, 1908.

THE ELECTRICAL INDUSTRY IN FRANCE.—I.

By GEORGES DARY (Paris).

Although Paris is, geographically speaking, only a few hours' journey from London, France from a commercial and industrial development point of view is altogether different to England. The mental temperament of a French manufacturer is of quite a special character and cannot be compared with that of an inhabitant of the United Kingdom. If the industrial application of certain discoveries sometimes, or mainly, takes place outside France, the cause is principally to be found in our financial timidity, our want of initiative, and our general hesitation and fear in matters of commercial enerprise.

In France the wealth of the country is very much divided up, that is to say, instead of being held by a relatively small number of persons it is spread over a large proportion of the population. Every Frenchman hoards up his money and economises in order that he may possess the proverbial "long stocking" when old age comes on. He adds the annual savings that he is able to put by, though frequently this is only possible by depriving himself of all luxuries, and he experiences no temptation to risk his money in a financial enterprise, notwithstanding the advantages he might gain by so doing, and however serious and feasible the undertaking. But as the characteristics of the Latin race form part of his nature, he develops an inexplicable enthusiasm for a pseudo-sensational discovery, which, when applied industrially, shows no profitable return, and by a complete lack of judgment he risks his capital in it, suddenly and without serious consideration. Naturally, the undertaking is not a success, partly as a result of a mediocre administration, and partly because of unduly high out-goings quite out of all proportion to the results to be attained—in fact, it fails owing to a lavish extravagance quite French in character. The capital is thus lost, and our desperate capitalist blames the promoters of the undertaking; in fact, blames everybody except, of course, himself, who was unable to distinguish between a serious affair and a "bluff," and vows that he will not be caught again. Here we have an explanation of the non-success of industrial enterprises in France and the mental temperament of French capitalists.

It must also be admitted that when it comes to matters of technology, to scientific principles, to laws and theories to be solidly based on irrefutable grounds, to discoveries as a result of experiment, and a thorough knowledge of physical and chemical phenomena, the French undoubtedly occupied a leading position. We may claim with a legitimate pride, in rapidly turning over the pages of history, that the majority of great inventions have originated in France, the developments in matters electrical in particular belonging very largely to us. We may claim, too, that by atavism, or by the remembrance of our ancestors—the great physicists and philosophers—there still remains a little of that spirit of experiment, of intuition, of deduction, of scientific trust and belief, which is sooner or later crowned with success, and which, in some degree, constitutes one of the main characteristics of French scientific thought.

The result of this peculiar trait, and of our mental state, has been that the majority of the discoveries which have had their genesis in France, have been developed and industrially exploited abroad, and have, so to speak, made a tour of the world before again reaching our country. There is no need to enumerate the many examples that might be cited; any thoughtful person can think them out for himself without difficulty, and the electrical industry is always at hand in proof of the theory.

If the electrical industry has acclimatised itself in France slowly—very slowly—it can only be attributed, first, to the French temperament, as we have endeavoured to explain; and, secondly, to the fact that our Government and other authorities have never done anything to facilitate the introduction of new methods, whether of lighting or of traction, but have, on the contrary, appeared to be more concerned with endeavours to delay their adoption as long as possible. Our municipal councils, and that of Paris in particular, too frequently had among their members the largest shareholders in powerful gas companies, and, therefore, did not encourage the establishment of a rival. Since 1878, the date of the first appearance of the electric light in Paris, there has been a succession of artfully planned struggles against the electric lighting companies to hinder their onward march. The experience in France is that, in official circles, the personal interest always stands before that of the public, and it is only as a result of being forced by public opinion that municipal and other authorities have, little by little, accorded to electricity rights and privileges almost equal to those possessed by its rival—gas.

Ignoring these long struggles and looking at the actual position of electricity in Paris at the present time, we find that by a decree dated September 25th, 1907, the Convention proposed by the municipal council with regard to the distribution of electrical energy was approved. What may be termed the transitory period commenced on November 1st, 1907, and will continue until December 31st, 1913. According to this convention, the different stations which supply Paris have a monopoly of the public and private lighting at the following maximum rates:—·7d. per hectowatt-hour for lighting, and ·3d. for all other uses. Within six months of the date of the convention, the concessionaires will replace themselves by a company with a capital of £2,000,000 and the title La Campagnie Parisienne de Distribution d'Electricité. The definite term of the agreement is from January 1st, 1914, to June 30th, 1940. Unless the Convention is cancelled by the city—it will have power to do this on June 30th, 1924, and in any succeeding year by giving notice two years in advance, and by paying the cost of the original installation—the tariff will then be ·5d. for lighting and ·3d. for all other purposes.

The prices are still too high for private users. In fact, in some suburbs certain companies are to-day supplying energy at rates varying from 5d. per kilowatt-hour, and in Paris it is supplied to large consumers, such as the Metropolitan and the railway companies—the Ouest and Orleans—at prices lower than 1·2d. per kilowatt-hour; seeing that it is hardly likely that these contracts were entered into at a loss, it may be taken that the net cost per kilowatt-hour is less than the last-named figure. Consequently, the rate of 7d. may be considered an unduly high price, and one which should be considerably reduced. For lighting and power purposes respectively, rates of 5d. and 2½d. would certainly leave a sufficient margin for profit and payment of dues, and the adoption of this tariff would have increased the receipts of both the concessionaires and the City of Paris. The electric light, which is still a luxury in Paris, would then find its way into the most modest habitation, as it has already done in certain provincial centres where electrical energy is supplied at a moderate price. Not only so, but with cheap electrical power, one would see a revival of home industries, such as has occurred in the weaving industry of Lyons and in the St. Etienne district in the Loire; each working family in grouping itself around an electric motor can improve its condition by being able to turn out work which even under modern conditions proves remunerative.

It is by this increased use of electrical energy for power purposes that the concessionaire can obtain a better result from his plant, and obviate the familiar peak which has always been the excuse for high rates.

The minimum consumption should disappear, and no contracts should be entered into for a less period than one year. As regards the voltage, which is now frequently 220, this should be reduced, universally to 110, for a pressure of 220 volts has many disadvantages in the case of Parisian houses, and the difficulties of insulation are much greater. The costs of distribution in France are, therefore, very unequal—too high in Paris for the concessionaires to realise any profit, owing to the great number of consumers, and formerly too low in certain provincial districts. In this connection I may instance a case in a part of the Eastern Pyrenees, where about ten years ago 16-c.p. lamps were supplied with current for 1s. 3d. per month, or ½d. per day, and electrical energy for power purposes as usual, at half these rates. These inequalities, fortunately, are now showing a slight tendency to disappear. While in Paris and in certain large centres charges are still much too high for the supply undertaking to prove remunerative, the rates in the privileged districts, such as, for example, the Pyrenees, have been revised and put on a uniform scale in such a way as

to allow of a reasonable profit being made. The result has immediately been the placing of the large exploiting companies on a much more satisfactory footing.

One of the principal factors of this change and improvement in the electrical industry in France—notably in the districts of the Alps and the Pyrenees—during approximately the past ten years, has been the utilisation of numerous, one might say the numberless, waterfalls available. The other factor has been the formation of huge companies with large capital, which have from time to time become amalgamated in accordance with the example which has been set by foreign countries.

The establishment in France of branches of the Thomson-Houston and Westinghouse concerns gave a considerable impetus to electrical matters. By degrees these two companies have acquired and absorbed a large proportion of the undertakings, and with the new ideas of business which they have introduced into our country they have caused both capital and men to spring out from a fruitful soil.

If we were to prepare a list of French—exclusively French—electrical engineering concerns, it would be an extremely short one. By mentioning the names, as they come to the mind as we write, of La Compagnie de l'Eclairage Electrique, which manufactures Labour machinery, the Breguet Co., Messrs. Sautter et Harlé, La Société Alsacienne, Les Etablissements Decauville, La Compagnie La Francaise and Messrs. Schneider & Co., of Le Creusot, who have established an electrical machinery branch at Champagne-sur-Seine (Seine et Marne), we have practically completed the list. Few of these concerns supply large plant to important central stations; it is mainly auxiliary material that they turn out—searchlights for the Navy in the some cases, electric motors, or equipments for lighthouses, &c., in others. On the other hand, La Campagnie Thomson-Houston—which has lately absorbed the Postel-Vinay business—the Westinghouse Co., of Havre, and La Compagnie de Creil, which exploits the Siemens-Schuckert system in France, rule as the dominant concerns—particularly the first two—in the trade. Adding to these the productions of the Alioth, Brown-Boveri, and a few other concerns, of more or less importance, we have a complete list of the different makes of plant most frequently employed in French central stations. The remaining firms, those which we have not named, are manufacturers of specialities in the way of minor equipment, lamps, cables, telephones, insulating material, accumulators, &c., and they are making good profits and enjoying great prosperity. The reason for this is not far to seek: their general expenses are not so high, and their sales being more continuous, are more profitable. The large engineering concerns, on the contrary, have had to lay down enormous plant to turn out the large generating units now in vogue, and they cannot hope to cover the original cost of establishing the factory by the occasional sale of a few machines. Nowadays, an engineering concern cannot realise any profit except by specialising on a well thought-out system. This is beginning to be realised, and the majority of the French firms mentioned above are now devoting themselves to special branches in order to maintain their existence.

The utilisation of water-power has, as we have pointed out, been the principal factor in the development of the electrical industry in France; until this commenced, the trade merely vegetated — now it is full of a life and vigour which will equal that of its neighbouring industries.

As a matter of fact, so long as only steam and coal were ultilised in the generation of electrical energy, current could only be supplied at far too high rates—as is the case in Paris still—for it to be generally adopted and consequently to prove remunerative. France, in contradistinction to England, Germany and Belgium, consumes more coal than it produces. The output from French mines does not exceed 34 or 35 million tons per year, while the consumption reaches 45 million tons. As is usually the case, and in the natural order of things, if France is short of coal, it possesses a counterbalancing advantage in the many streams, rivers, waterfalls, glaciers and other sources of water power, which can now make up for the scarcity of coal and replace the country in that proper industrial position which it can and must occupy. The huge supply enterprises which are being organised, especially in the South of France, are an undeniable proof of this.

The statistics recently published by M. Montpellier prove it still further. Before their appearance, nothing definite and certain could be stated. Even the Minister of the Interior, who should be kept officially *au courant* with what is taking place in France, did not possess complete documents, this being an instance, as we may point out in passing, of the French *insouciance* with regard to the regulation and control of undertakings affecting the public welfare.

Glancing over this curious return, we find that out of 1,413 electricity generating stations which existed in France at the beginning of January, 1907, and which made use of the public roads for supplying current to private consumers (excluding consequently the private installations), no fewer than 1,000, or more than two-thirds, were utilising water power—alone in the case of 831 stations; with a steam plant by way of reserve at 131 electricity works; and with gas or oil engines as reserves at 38 stations.

The 1,413 central stations supplied 2,912 localities with lighting, heating and power, while, as regards gas works which are daily losing more and more ground, 824 of them were only supplying 1,209 districts. These few figures alone are sufficient to confirm the importance which the French electrical industry, thanks to stations utilising water power, has attained.

We have not mentioned particularly the special services required in connection with electric traction. The omission has been made intentionally as the subject would require considerable space and necessitate a detailed and exhaustive study. We will only state that the large French railway companies have not interested themselves very much in the question of adopting electric traction on their main lines. Alone, the Western and Orleans Railway Companies have two electrically-worked sections; the first, starting from the Gare des Invalides, in Paris, runs as far as Versailles; the other starts at the Gare d'Orsay, Paris, and since 1906 it has run as far as Juvisy. The two lines which are on the third-rail system, do not extend beyond 12½ miles each. The Western Co. is contemplating a new electrical installation for its suburban system—on the right bank of the Seine from the Gare St. Lazare, Paris, to Argenteuil, 6¼ miles on the one hand, and to St. Germain-en-Laye, 15 miles on the other. If to these actually-running or projected lines, we add the Metropolitan Electric Railway in Paris and a few mountain railways which could better be included with electric tramways on the trolley system, we have a full list of the electric railways in France.

As for the electric tramways, these represent a total length of from 300 to 440 miles; the major part of the suburban lines and those in small towns are worked on the overhead conductor system, while in large cities such as Paris, Tours, Lyons, &c., there are several lines equipped on the Diatto surface contact method. The underground conduit system is only used on three lines in Paris, municipalities and tramway companies hesitating to adopt it on account of the high cost of installation.

Finally, the electro-chemical, and especially the electro-metallurgical industries, have for several years past been amongst the most prosperous in France, due to the recent discoveries and developments of Messrs. Keller-Leleux, Gin, Girod and Héroult, which have brought about important modifications in the original types of electrical furnaces, which new concerns are now using them for the smelting of ores and for the production of special qualities of steel. This is an industry peculiarly French; it first saw the light in France, it has been developed and improved there, and has found a natural and commercial application and extension in the country. It is estimated that already more than 100,000 H.P. is taken by French electro-chemical and electro-metallurgical works, the principal ones of which are at Chedde (Isère), Ugine (Savoy) and St. Vrain.

To illustrate by examples this general review of the French industrial situation, we propose to refer to two of the most recently established central electricity stations distributing current over a large area, which will become, in the near future, models on which all others will be based, and which, being amalgamated into one financial group, will end in the realisation of a French electrical industry trust.

PUBLICITY FOR SMALL UNDERTAKINGS.

By B. N.

(*Continued from page* 460.)

Hire of Miscellaneous Apparatus.

Apart from hire of wiring for lighting and hire of motors, there is the question of hiring out electric irons, radiators, cooking apparatus, &c. The golden rule is :—Do not hire out any of this apparatus if it can possibly be avoided ; but if you must occasionally hire out these things, charge a heavy hire price, 30 per cent. to 50 per cent. per annum on the cost. There are only two reasons why anyone should want to hire : either they are afraid the apparatus is costly in upkeep or current, or else they want to use it for a short time only.

The first case is easily met by giving an estimate of cost, with a week's free trial to prove it ; and the second case is best left alone, as the apparatus will soon be thrown back on the hands of the supply authority.

The great danger of hiring out this class of apparatus is the rapid improvement and change through which it is passing. This soon makes it obsolete, and means a very heavy yearly depreciation to keep it at market prices, even if it has not to be entirely written off as unsaleable. The cost of most of this apparatus is quite small, and there does not seem to be any good reason for hiring it out. A few articles kept in the show-room and lent for trial seem to be all that is necessary. A very good plan is for the manager to use these things himself and show them in use to any interested person.

In days to come, when electric ovens have been properly standardised and are commercially possible for the average consumer, it may be necessary to let them on hire in order to compete with the gas companies ; but it seems unsafe to do so at present, particularly as the people who would use an electric oven must necessarily belong to the class who could quite well afford to buy it.

Hire-Purchase.

All the previously mentioned hire systems were originally intended to get over the initial cost of fitting up electrical installations, and, while most of them can be made remunerative by careful management, by far the best system for this purpose is that known as hire-purchase. This simply amounts to selling an installation by quarterly payments, with a small addition for interest on the money outstanding.

The great point in favour of this system is that the consumer agrees to pay the whole cost, and so long as he does not become bankrupt the supply authority cannot very well make a loss, and even if he does become bankrupt the installation comes back into the hands of the supply authority, to sell again or take out as they choose. There is no trouble with new tenants, because the original party under the agreement is responsible, and any further arrangement he may make with his successor has nothing to do with the supply authority.

Usually 7½ per cent. interest on the money outstanding is considered sufficient, that is, 5 per cent. interest and 2½ per cent. extra to cover office expenses and expense of agreement. This will generally be more than sufficient and will leave a little in hand to go towards any small losses that may be incurred.

The easiest way to work the system is to make all the payments equal throughout the agreement. For instance, if £24 is to be paid off in three years, each quarterly payment will be :—

One-twelfth of £24	£2	0	0
Add 4 per cent. on £24 for three months ...		4	9
Total instalment	£2	4	9

This is not quite accurate, but is near enough for practical purposes.

This system has the great advantage that the undertaking has not to find continually increasing capital, because the whole capital is quickly paid up. The supply authority has also a much firmer hold over the consumer than in any hire system, and yet the consumer gets his installation on very reasonable terms.

This system, intelligently worked, can be made of immense value to the undertaking, as it will bring on many excellent consumers who, otherwise, would not go to the expense of putting in electric light or power. In addition, the consumer feels he is getting something for his money, as the installation is soon paid off, whereas hire goes on for ever.

It is the general experience that very few hire-purchase customers give up using the installation. The very fact that they would have to complete the payments, and yet get no benefit for the outlay, will keep many people on the mains who otherwise might consider gas lighting.

Of course, the manager must see that the people he takes on this system are financially sound. This is a very easy matter in a small town, and a competent manager can make all his inquiries without causing any offence or unpleasantness. If this very elementary precaution is taken, there is practically no risk in the system ; and it has been in use in many towns for a number of years without a single loss being recorded.

One word of caution is necessary : the agreement form should be revised by a competent lawyer with a view to protecting the supply authority in the event of the consumer becoming bankrupt. If the agreement is badly drawn, the supply authority, instead of recovering the installation, may find that they only rank as one of the creditors, in which case a considerable loss is possible.

Tariff.

Possibly the most important matter in the commercial management of a supply undertaking is to have a straightforward, simple, and if possible, cheap tariff. A very great amount has been written on the subject of methods of charging, and it is not intended, in this article, to give a long account of each tariff, but only to give a few arguments for and against the various methods of charging.

It must be remembered that these remarks only apply to towns of 30,000 inhabitants or less ; but even with this reservation there is an immense difference between various towns, and a tariff that is popular in one town may be a failure in another. For this reason every manager must closely study his own particular town.

The following suggestions are only put forward as the result of experience in a number of small towns, and it must not be forgotten that exceptional towns require exceptional tariffs.

It may be taken for granted that all tariffs should be based on a fixed charge per kilowatt of demand to cover interest on plant and standing charges, and, in addition, a small charge per unit to cover those working expenses which are proportional to the output in units. In fixing the price per kilowatt of demand, it must be remembered that the maximum demand of any individual consumer may not coincide with the time of maximum demand on the central station ; and to arrive at a correct tariff, this diversity factor must be taken into account. This may be done by making an all-round deduction in the price per kilowatt of demand, or by giving better terms to those consumers whose maximum demand falls outside the peak load of the station : the latter alternative is obviously more fair than the former.

The well-known maximum demand system of charging is based on this principle, but its main defect is that it does not take account of the diversity factor unless combined with the time switch. It is also extremely unpopular and difficult to explain. Another drawback is that a special demand indicator is required for each consumer, and, in a small town where the consumers are usually small, the extra outlay more than wipes out any advantage in the system.

Another very serious drawback is that it prevents the use of small heating and cooking apparatus off the lighting circuit, because it may seriously raise the demand.

After extended trial of the standard maximum demand system, the general opinion among managers in small towns is that it has been a failure.

The alternative of a fixed flat rate is not satisfactory, because if it is made sufficiently high to make the short-hour

user profitable, it makes electricity too expensive for the long-hour user.

These difficulties are sometimes met by using a time switch, and charging a high rate during the hour of the central station top load, and a low rate at other times. The objection to this is the expense of double-rate meters and time switches, also the attention the time switches require. It is a good system where the consumers take a large supply, but in small towns the cost is excessive.

Any manager would prefer to do without offering alternative rates, but it does not seem possible to carry on a satisfactory business in a small town with only one rate. The alternative rates should be kept as simple, and as few as possible. For a small industrial town, the following lighting rates have proved fairly satisfactory :—

A flat rate fixed to be fair for ordinary users, such as shops and houses, whose average use is less than two hours per day of their maximum.

For extra long-hour users, such as clubs, public houses, &c., a reduction in the flat rate after two hours' average use. This is ascertained by installing a demand indicator, for which a small extra rent is charged.

These rates meet nearly every case in this district, and are quite simple to work. They are reasonably fair to the consumer, and they avoid the necessity of installing demand indicators in about 75 per cent. of the consumers' premises.

For anything exceptional, that is, where the lighting is entirely outside peak hours, or where the supply is large, the supply authority offer, as an alternative, a special contract for five or ten years, based on a calculation of the probable cost for supply. This point will be mentioned later.

For power purposes the consumers are roughly divided into two classes :—

1. (*a*) Motors that are used intermittently. For these a flat rate is quoted.

(*b*) Also motors that are used intermittently, but not used during peak load :—A reduced flat rate.

2. Motors that run for 50 hours and more per week :—A flat rate the same as for 1 (*b*) with a reduction for all units used in excess of 2,000 per quarter.

These power rates work quite well in a district where the majority of motors are in factories and work steadily all the week ; but the rates would be quite useless in, say, an engineering district.

In power, as in the case of lighting supply, anything exceptional either in the hours of use or the size of the supply is taken on as a special contract. In a large town these special contracts might be troublesome, but in small towns they are few in number and quite easily worked, always provided they are based on a fair charge per kilowatt of demand plus a charge per unit for working expenses.

Supply to radiators, cooking apparatus, irons, &c., falls naturally into Sec. 1 (*a*). Sec. 1 (*b*) has the drawback that it may be necessary in a few cases to put in a two-rate meter and time switch ; but in a small town it is quite easy to keep an eye on any doubtful case, and if it is tactfully explained that in the event of a consumer breaking an agreement, these devices will be put in and he will be charged rent for them, it is surprising how little trouble arises.

(*To be continued.*)

A NEW SYSTEM OF FORMER WINDING FOR SEMI-CLOSED SLOTS.

The use of semi-closed slots is now very general in many types of dynamo-electric machine. In induction motors (hundreds of thousands of horse-power of which are sold every year) they are almost universally employed on account of the very great saving of cost which their use allows. In alternating-current generators they are almost equally universal, and some firms are even using them for continuous-current machines. The only important drawback to their use is the fact that they are considerably more difficult to wind than completely open slots. For many years the methods of assembling coils in open slots have been the subject of much study, resulting in the evolution of a considerable number of excellent methods of former winding. A certain amount of attention has also been devoted to the much more difficult problem of assembling coils in semi-closed slots, but it may fairly be said that the latter subject has been far less developed than the former. It is the purpose of the present article to describe a new system of former-winding patented by Mr. F. Creedy ; but it will be well first to discuss briefly the methods of winding for semi-closed slots at present in use.

The original method of hand-winding, once universal and still in use by many firms, is as follows :—

The slot is first insulated, then filled with short pieces of wire of about the same size as that to be wound. These wires usually project 3 or 4 in. at each end of the slot, and are known as "dummies." A long piece of wire is then taken (usually long enough to wind at least one pair of slots, or even one pole) and one of the "dummies" is withdrawn so that the wire can be threaded through the slot in its place. Thus the object of the dummies is seen to be that of keeping the wire straight, and in one definite place. Some winders now proceed to pull half the length of wire through the slot so that one can work with each end in turn, and thus have only half the wire to manipulate instead of the whole. This, however, is a rather bad plan, as, unless great care is taken, one is liable to get adjacent turns with a considerable potential difference between them. A more usual plan, therefore, is to pull only a short length through in the first place, and then pull the other end through the other slot which is being wound. The loop thus made passes round a former, the object of which is to give the end of the coil a suitable shape. The wire is then coiled round and round through the two slots, one "dummy" being removed each time. For the first two or three turns, obviously, almost the whole of the wire must be pulled through the slot, and the length to be pulled through gradually shortens as the wire is wound.

This method has a very important advantage in cases where it is desired to get the utmost possible output from a machine, viz., that the wires may be put in very tightly, and thus all available space may be used to the best advantage. It has, however, many serious defects. It is very slow and tedious, and requires two winders, one to pull the wire through and the other to arrange the loop on the former as it is drawn tight. Also since the whole length of the wire has to be drawn through both slots for every turn that is put on, the risk of abrasion of the insulation is very great ; in fact, bare places in the wire frequently occur (more especially with tight windings), which have, of course, to be insulated afresh.

To diminish somewhat the friction of the wire against the "dummies," a common practice is to rub it over with paraffin wax, whereby it acquires a smooth glossy surface which much diminishes the friction. It is, however, very difficult to prevent the long length of loose wire from lying about on the floor and thus becoming dirty, the paraffin wax assisting materially in picking up the dirt, which, of course, is bad for the insulation. To sum up, the disadvantages of this method are :—

1. It is very slow and costly to wind, and requires two winders.
2. Wire gets dirty and runs a considerable chance of abrasion, therefore insulation is poor.

Its advantages are, that it enables the slots to be filled very tightly and does not require very highly skilled labour.

Theory and practice combined show that neither the wide open slot, nor the totally closed slot, is so suitable electro-magnetically as the semi-closed slot, and this has naturally directed attention to means of getting the wire through the slot opening. Though such a plan usually entails the employment of several small wires in parallel, and hence reduces the cross-section of copper which can be got into a given slot, yet the other advantages gained by its use often outweigh this drawback.

A common method of hand-winding, which inserts the wire through the slot opening is the following :—

The length of wire necessary for one slot is not cut off from the reel, as in the previously described method, but the wire is handed direct from the reel, uncut. The end of the wire is first placed in the slot, and enough slack drawn off the reel to enable a turn to be taken through both slots. The wire is then passed through the slot-openings and coiled round through both slots in the manner

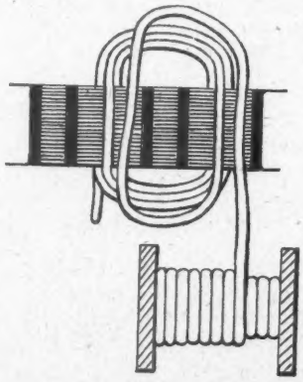


Fig. 1.

illustrated in fig. 1, which represents a development of a stator in course of winding. The horizontally shaded portion represents the iron surface, and the vertical black spaces are the slot-openings. A number of turns are seen to be already in the slot, and enough slack wire is shown lying on the iron surface to form the new turn. This method of winding is very much more rapid than the last described, and only occupies one winder, but it

does not admit of the slot being filled so full. It is rather difficult, too, to prevent the wires from moving about in the slot, as "dummies" cannot be used. The device usually employed in place of these is a wooden wedge, which is inserted after each turn has entered, to hold it tight.

Such a system has several great drawbacks, such as the impossibility of using a tubular form of insulation, the difficulty of filling the slot at all full, the difficulty of thoroughly impregnating the coils with any insulating compound when once in the slot, and the very great chance of getting crossed wires, resulting in damage to the insulation.

Some firms instead of winding off the reel in the manner just described, cut off sufficient for one slot, roll upon a bobbin, and pass this bobbin to and fro through the stator, thus producing a similar type of winding.

From the system just described the transition is easy to the method of former winding at present used by so many firms. In this method, the coil is first wound loosely on a former, so that the wires in the "active length," or portion which is to lie in the slot, may easily be separated. The coil so wound is next laid over the openings of the slots which it is to fill, and the wires are pressed individually through the slot openings by means of a flat piece of fibre somewhat longer than the slot and capable of going through the slot opening. This method of "stuffing them in somehow" is

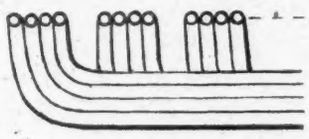


Fig. 2.

fairly quick, when used by a practised hand, but it is easy to see that the wires may very easily get crossed and tangled, and that the slot can never be very tightly filled. In the two latter methods there is considerable risk of abrasion as the wires come through the slot openings, and, moreover, it is just those parts which lie in the slots, and, therefore, cannot be got at to be repaired, which are most liable to damage.

An endeavour to combine the advantages of these various methods has led to the invention of the system of former winding which we are about to describe. First we may note that an ideal former winding should have the following properties:—

1. That part of the former winding, which is to lie in the slots, where space is most valuable and repairs are most difficult, should be completed and fully protected by insulation before leaving the former.

2. If possible the coil should not need to undergo any change of shape after leaving the former. If this cannot be avoided, it should be merely the ends of the coil, where there is plenty of room, which should be altered, and not the active length.

3. It should be possible to use insulation tubes, especially for high-tension work.

4. Coils should be capable of being removed for repair and then replaced.

Now, if we had a mere U-shaped coil, open at one end, we could clearly push it longitudinally into the slot. But, as a matter of fact, the coil usually consists of several turns, and is therefore closed, so that the closed end stands in the way of its longitudinal insertion. Some firms even find it worth while to cut open this closed end, straighten it out, push the U-shaped coil so formed through the slot, and resolder each individual turn.

The principle of the new system provides another method of longitudinally inserting the coil, by bending up the closed end out of the plane containing the slots, in the direction of the air-gap. If

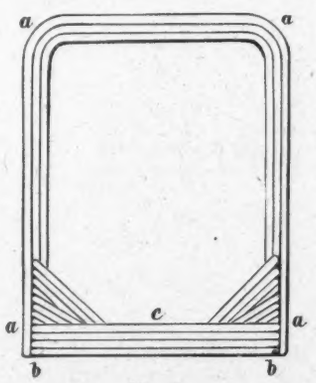


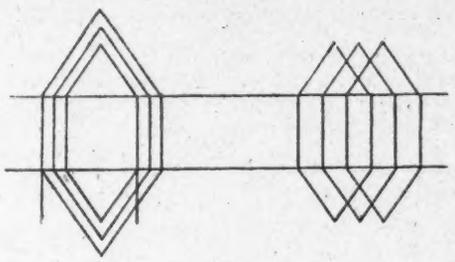
Fig. 3.

the coil is to go in, of course, the turned-up portion must slide longitudinally along the narrow slot-opening. In order to do this, the wires must be re-arranged so that they fall into a single layer and project up vertically, as shown in fig. 2, which represents a cross-section of a coil at that part which must pass through the slot-opening.

The new coil consists, then, of a U-shaped portion *a*, *a*, *a*, *a*, fig. 3, including the two active lengths, also two narrow vertical portions *b*, *b*, and the connection *c* between them, which is elevated above the plane of *a*, *a*, *a*, *a*, and may be of the same cross-section as *a*, *a*, or of any convenient form.

This construction presents the following advantages:—

1. That part of the coil which lies in the slot is in no way disturbed after leaving the former. Consequently, the risk of short-circuits inside the slots due to the way in which the active lengths have been



Figs. 4 and 5.

manipulated is eliminated. In the latest type of coil, no part whatever of the coil is disturbed after leaving the former, and the whole can be completely insulated first, as in the case of open-slot coils.

2. The coil may be wound far more closely than with any ordinary method of hand-winding, except, perhaps, the pull-through method; so that if we are content not to get in more wire than in a form-wound machine of the ordinary type, the coil will enter the slot very easily, thus not only saving a large amount of time, but also allowing it to be inserted or withdrawn at pleasure. Such a machine, then, is extremely easy to repair.

3. On the other hand, if we elect to fill the slots tight, we can obtain as tight a fit as with pull-through hand-winding, while yet retaining the advantages of former-winding.

4. A solid tube of insulation, with no break in it whatsoever, can be built up round the coil before insertion, the insulation then entering with the coil. It is also easy to insert insulation between the layers during winding. These features, which cannot be

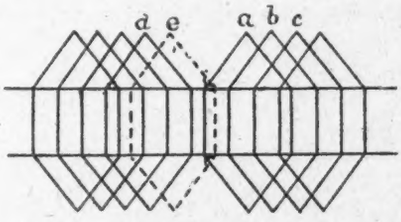


Fig. 6.

obtained with other types of former-winding, are of very great importance in all high-tension work.

5. It is easy to arrange the winding so that the coils may be withdrawn and replaced from stock without displacing more than a few of the others.

6. If we compare it with the pull-through method of hand-winding, the saving of time and labour is of course enormous, amounting to 50 per cent. at least, and the wire is in far better condition when inserted, as it is not lying about loose picking up dirt during winding, and is not pulled many times through the slot with the risk of abrasion every time.

Before describing in detail the method of manufacturing the coils, it is necessary briefly to discuss the different methods of arranging windings, to show how the new system may be applied to each.

Two distinct methods of arranging windings are in use: the "spiral" or "non-crossing" type fig. 4, and the "drum" or progressive type of winding, fig. 5. In the first, the inner coils are of shorter pitch than the outer, and consequently, all coils belonging to one pole and phase are concentric, and do not cross each other; in the second type all coils are of the same pitch.

While the first type of coil may require rather less copper, the second has the important advantage in a former-wound machine of requiring only one former instead of two or three.

Now, the peculiarity of this new method of winding is that both the active lengths enter their slots together. This presents no difficulty when carrying out a winding of the "spiral" type; but, with a drum winding of an ordinary type, it may present considerable difficulty, as will be seen from the following:—

Starting from the coil *a*, fig. 6, we may proceed to put in the coil *b* without any difficulty, since the end connections of *b* may be made to cross *over* those of *a*. Having done this, we may put in *c*, and so on round the circumference until we come to *d*. The next coil *e* (shown dotted) should for symmetry pass under the end connections of *a*. Now, since both sides of *a*, according to the present invention, go into place simultaneously, it is impossible to get *e* under *a*. Hence either *e* must go above *a*, which makes a break in the symmetry of the winding, or a different type of winding must

be adopted, all the coils in which are of the same span, but in which the above disadvantage does not occur.

Such a type of winding is shown in figs. 7 and 8. After the first coil 1 has been inserted as shown, it is straightened, if necessary, and the ends are bent down parallel to the sides of the iron core. The next coil is then put in, not in slots 3 and 8, fig. 8, as would be the ordinary practice, but in slots 7 and 12, so as to clear the first entirely.

The second coil may now be bent down like the first, and, since it clears it, the end connections will fall in the same layer. The third coil is next inserted to clear the second, as shown in fig. 7, in

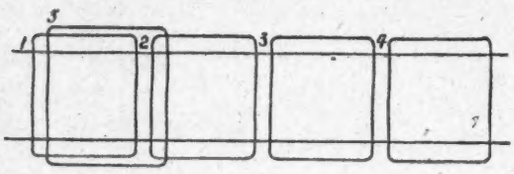


Fig. 7.

which all coils are numbered in the order in which they are put in. Not until we have gone completely round the circumference (or in a four-pole machine, inserted four coils) do we insert the fifth coil into slots 3 and 8, and then proceed round the circumference as before. In this way the winding is completed; and in an n-pole

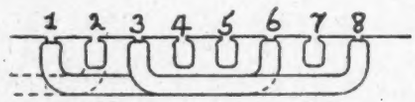


Fig. 8.

machine it will be noticed that the first n coils all fall into a single layer, and hence the total number of layers is equal to half the number of slots in one pole pitch.

A third form, which may occasionally be useful, especially with wide pole pitches, is the use of a coil shaped somewhat as in fig. 9 at (a), which may be distorted by bending the end

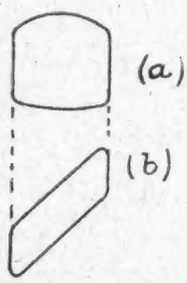


Fig. 9.

connections to the form shown at (b), in which it will be recognised that one side of the coil may enter before the other without preventing the application of the method.

The processes of shaping and winding the coils for this invention may be divided into two main classes, according as the bending of the end of the coil up into the air-gap, and the rearrangement of

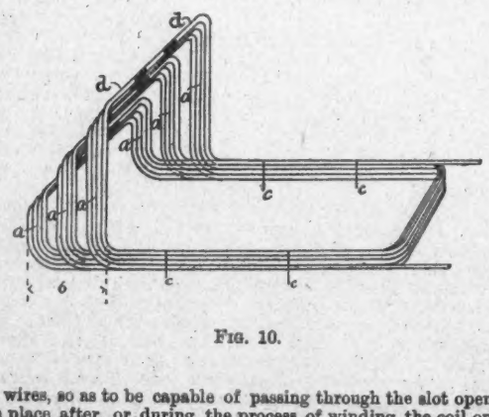


Fig. 10.

the wires, so as to be capable of passing through the slot opening, take place after, or during, the process of winding the coil on the former.

Class 1.—The coil is first wound in some convenient shape on the former. When the winding is complete, the wires are bent for insertion in the slot; when inserted the coil may be restored to its original shape, or to a shape more suitable to the operation of the machine. In certain cases no further manipulation is needed after the coil has been put in place in the slot. An example of Class 1 is shown in fig. 10.

Class 2.—The shape appropriate for entering the slot is produced during the actual winding of the coil, and when the coil is in place the shape may be altered to that which it is finally to assume, or in certain cases there may be no need for further alteration. An example of Class 2 is shown in fig. 11. Each of these methods may have advantages in special cases.

Class 1 has the advantage that the coil when in place and complete is of a simple form, such a might be used with an entirely open slot, and, moreover, permits the rotor and stator to be separated in either

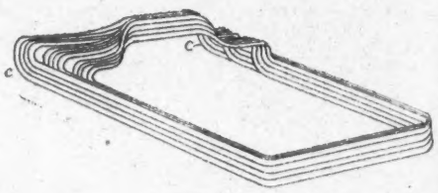


Fig. 11.

direction. Where this is not desired, however, a certain saving may in some cases be effected by leaving the coil permanently in the shape it had when inserted. This may be of some importance where very heavy and thick coils have to be dealt with.

Class 2 saves the labour of bending, and rearrangement before insertion, with somewhat greater expense in winding the coil in the first place. As in the case of Class 1, if the rotor and stator need not be separable in either direction, the coil will in some cases require no further alteration after insertion.

It will also be seen from fig. 9, that in some cases, types of windings of Class 2 require less wire than those of Class 1. The precise method of winding to be adopted, will, of course, depend on the circumstances.

It will be of interest first to describe the original method of winding Class 1, as it has done good service, though now being superseded.

The coil is first wound upon any convenient type of former. By way of example, a simple rectangular former will be taken such as is shown in fig. 12. The cross-section of the coil when wound

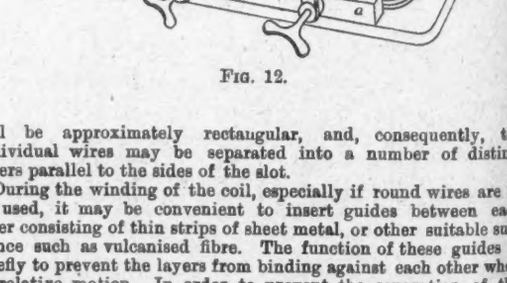


Fig. 12.

will be approximately rectangular, and, consequently, the individual wires may be separated into a number of distinct layers parallel to the sides of the slot.

During the winding of the coil, especially if round wires are to be used, it may be convenient to insert guides between each layer consisting of thin strips of sheet metal, or other suitable substance such as vulcanised fibre. The function of these guides is chiefly to prevent the layers from binding against each other when in relative motion. In order to prevent the separation of the constituent wires of each layer, a well-known device consisting of sheet metal clips wrapped temporarily round each layer may be employed, care being taken not to abrade the insulation.

When the winding is completed, strips of wood or other suitable material (shown at a, a) are laid on top of the active lengths of the coil so as to completely fill the groove in which it is wound. These may be held in place by clamps (b, b), or other suitable means.

A portion of the cover or side of the former is next removed so as to expose that portion of the coil which is to be bent, and to allow of its free manipulation.

A round pin d may now be placed on top of that portion of the coil, which has been uncovered, of such length as to span both sides of the coil. It may conveniently be clamped in place by means of a bolt passing through a slot in the former, as shown, since it is necessary for the pin to be moved to and fro. The body of the

former c is shown with a portion removed at *e* to facilitate handling the ends of the coil. This portion may, with advantage, include the corners *m*, *m*, as if binding of the layers takes place anywhere, it will be at these corners. *f* are the guides consisting of, say, strips of vulcanised fibre passing from one of the bends in the coil round the end of the former to the other bend. It should be noted that they are spaced some distance apart along the end of the former by packing (not shown), so as to leave a clearance between the layers at the ends to further facilitate their separation.

Placing the pin as near as may be found convenient to the end of the coil, we may now bend up the inner layer edgewise round the pin, it being completely constrained by the guides, so that it cannot lose its shape. The pin is now moved back through rather more than the depth of one layer, and the next layer bent up in a

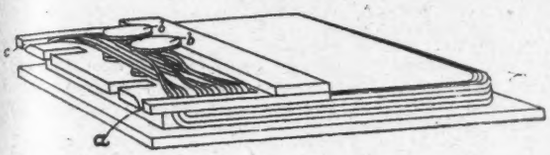


Fig. 13.

similar manner, passing over the first. The pin is now moved again and the third layer dealt with in the same manner.

The result of these operations is shown in fig. 12, which illustrates the state of affairs just after the third layer has been bent, *h*, *h* being the sheet-metal clips used to keep the layers together while bending; slots are provided in the former, so that these clips may be put on during winding.

When the coil is removed from the former it will appear as in fig. 10. These portions, as at *a*, *a*, *a*, which must pass through the slot opening, now lie in parallel planes, and the natural elasticity of the coil will permit them to be brought into a single plane by a little pressure.

Insulation.—The coil may either be taped, or the insulation may take the form of a lining in the slot. In both cases the insulation should preferably be placed round the coil before it enters the slot, as, if the insulation is placed in the slot beforehand, the coil has a tendency to push it out as it enters. Any insulation in the form of tape has a tendency to be ravelled back as the coil enters, so that the outer layer, at any rate, should be of a continuous nature, and should be chosen with some regard to its mechanical strength, as well as its insulating qualities, since it has to rub against the sides of the slot while entering.

Of course, the insulation may be covered permanently with a sheet metal liner if thought desirable, and if there is room.

One method of producing a coil of Class 2 on a former is shown in fig. 13. When each wire reaches the point at which it is to be bent, it is turned up through a narrow groove shown at *a*, which nearly imitates the slot-opening through which it is to pass.

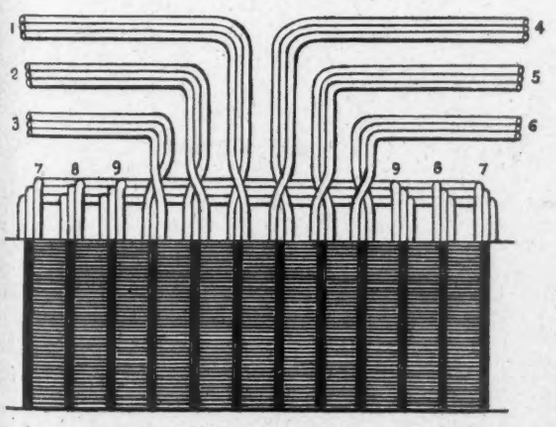


Fig. 14.

It then passes round the bobbins *b*, *b*, whose object is to form the end to a rectangular cross-section. After this it passes through the groove *c*, and thence round the former again.

A most important advantage of this method of winding is the possibility of repairing a single coil without injuring any others. One method of doing this is shown in fig. 14, which shows a three-phase winding arranged in two layers or ranges.

The six coils in the upper layer are left with the narrow vertical portion just as when the coil went in, so that they may without difficulty be withdrawn. The lower coils, of course, are bent down, as shown. If an upper coil is injured, of course it is easy to remove it, the natural elasticity of the coil giving it enough play to enable it to pass over those inside it. With heavy wire, the outer coils as 1, 2, and 4, 5, may be given a slight elevation over the inner, so that they may slide out without disturbing them. If there is not room for this, as may often happen, the inner coils, as 5 and 6, must be removed before we remove 4, but, in any case, this can easily be done.

To repair a lower coil, such as 7, 8, or 9, the six upper coils must be removed, the injured coil cut out, and the new coil slipped in and bent down in place. It will be easily seen that a coil, such as 7, may be bent down from a horizontal position without disturbing 8 or 9.

In cases where there is not room for the above type of winding (which is mainly suitable for generators and large induction motors), the peculiar type of "progressive," or "drum," winding, described above, is used. In this the method of repair will be as follows:—

Cut out the complete layer in which the injured coil lies, press down those layers on top of it into its place, and put in the fresh layer of coils on top of all.

The patent method of winding above described has been assigned to, and is being introduced by, the Saxon Engineering Co., of Fenton, Stoke-upon-Trent, who also make machines for winding coils. Several licences have already been taken up, and it is expected that the process will be widely used, particularly for high-tension machines.

PROCEEDINGS OF INSTITUTIONS.

The Internal Structure of Metals.

By Walter Rosenhain, B.A., B.C.E.

(*Abstract of Lecture delivered before the* Institution of Electrical Engineers *at Manchester, March 10th*, 1908.)

The lecturer began by explaining the manner in which materials are examined under the microscope, briefly describing the methods of grinding, polishing and etching specimens and the modes of illumination which are used for the study of these opaque objects. Some special forms of microscope, designed for this purpose, were described with special reference to the manner in which the "vertical illumination" of metal specimens is obtained. The lecturer then went on to describe the typical crystalline structure of a pure metal, illustrating this structure by a series of lantern slides from photo-micrographs, representing some of the evidence upon which is founded the conclusion—now generally accepted—that the structure of metal is always crystalline. The manner in which a molten metal solidifies, and the growth of mutually interlocking and interpenetrating crystals from numerous centres of crystallisation in a cooling metal, were then dealt with, and in this connection the lecturer explained how largely the mechanical properties of a metal depended upon the manner in which these crystals grow, thereby explaining the influence of such factors as casting temperature and the presence of minute quantities of foreign bodies, either occurring as impurities or purposely added. The typical structure of binary alloys was next discussed and illustrated by a series of lantern slides showing the structure of a series of lead-tin alloys; the general character of the "eutectic" body frequently found in such binary alloys was explained and its influence upon the mechanical properties of the alloy was described. Passing on to the subject of the mechanical deformation and ultimate fracture of metals, the lecturer described the observations made by Prof. Ewing and himself some nine years ago, which resulted in the discovery of "slip-bands" and a recognition of the manner in which metals undergo deformation by the slipping or sliding of the elements of each crystal over one another, each of the crystals of the metal thus accommodating itself to the new shape imposed upon it by the circumstances of the deformation. A series of lantern slides was shown illustrating the nature and appearance of slip-bands, and serving to prove conclusively the truth of the explanation advanced by the lecturer. These slides included several representing actual tranverse sections of slip-bands obtained by Mr. Rosenhain, by the aid of his process of embedding metal specimens in electro-deposited copper whenever it was necessary to preserve an edge or a surface intact during the process of cutting and polishing a transverse section. In connection with the subject of slip bands, Mr. Rosenhain referred to the semi-plastic condition which, in iron and steel, follow upon plastic deformation; Muir's work on the recovery from this state produced by exposure to the temperature of boiling water was referred to, and from these facts an explanation was advanced of the causes which lead to the well-known phenomena of fatigue in edge tools and the recovery of their cutting power after prolonged rest; the advisability—from a metallurgical as well as a sanitary point of view—of dipping a razor into boiling water was also mentioned.

In the last part of the lecture, the various modes of fracture of iron and steel under tension, shock, bending and alternating stresses were described, and the microscopic features of the fractures illustrated by a series of sections of actual fractures, also obtained by the aid of the electro-embedding process. The lecturer laid great stress on the importance of the systematic investigation of fractures, more particularly of failures occurring in actual practice, since in that way the most useful information could be obtained as to the characteristic behaviour of the materials under various circumstances not readily reproduced in laboratory tests. Special reference was made to the manner in which the metal fails under the effect of alternating stresses; the crystalline appearance of the fractures produced in this way was explained on the basis of deformation by slip, and the view that vibration or alternating stresses could cause

metal to "become crystalline" was characterised as an entirely groundless and most improbable assumption.

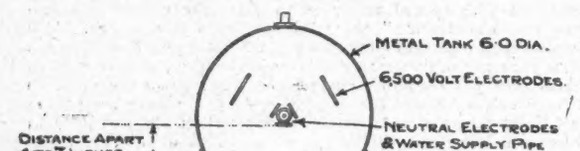
In conclusion, the lecturer admitted that the subject he had dealt with was not of an essentially "electrical" interest, but that in thinking of the body he was addressing, he had relied upon the word "engineers" rather than on the "electrical," and since they necessarily used metals for mechanical purposes in all their machines and appliances, the properties and nature of metal must be of some importance to them. The microscopic study of metals might, however, find some direct electrical applications; the connection between the micro-structure of alloys and their electrical resistance and their resistance temperature coefficient was given as one instance, while in another direction it was pointed out that there was certainly some connection between the magnetic properties of iron and its micro-structure, material showing high permeability and low hysteresis losses generally having a large crystalline structure; there appeared to be some resistance to the magnetic flux at the inter-crystalline junctions, but this was a subject deserving of much further investigation before any definite conclusions could be reached.

Artificial Load for Testing Electrical Generators.

By R. K. MORCOM and D. K. MORRIS.

THE following is an abstract of the discussion at Birmingham on March 11th by the INSTITUTION OF ELECTRICAL ENGINEERS (for the paper see our last issue):—

MR. J. P. KEMP (Birmingham) said that with wooden tanks he had experienced trouble; the troughs had caught fire, and the water leaked out. In Manchester, at the Stuart Street station, he had used for three-phase, 6,500-volt work, a circular iron tank 6 ft. in diameter and 4 ft. deep (see diagram A). The outer electrodes were symmetrically spaced at 120°, being about 7 in. away from the neutral electrode, and the water, which was introduced in the centre at the bottom of the tank, flowed away over a weir at the top. With this tank 4,000 KW. had been successfully absorbed for



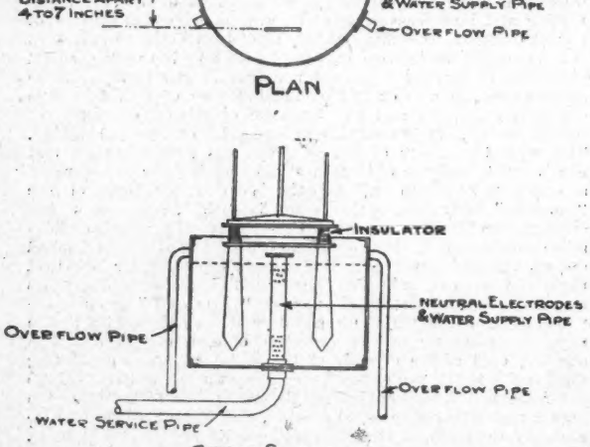


DIAGRAM A.

over six hours. The outer body of the tank also formed part of the neutral electrode; and as this was substantially earthed, there was no possible danger from shock. With wooden tanks, however, there was considerable risk of men receiving a shock from the body of the tank or even from the water. As a permanent adjunct to a central station a suitable water load was very desirable, for it enabled one to perform various adjustments to valves, governors, &c., as required. The authors' very ingenious method for obtaining loads of varied power factor was the only simple and satisfactory apparatus which had so far been adopted; up to the present, although a variety of inductive load tests had been called for in specifications, he did not know of any case in which they had actually been carried out.

MR. J. M. WALSHE (Birmingham), referring to the circular tank, said that it would be quite impossible to use this with Birmingham canal water at 6,000 volts, as the maximum load would be too great. With low resistance water it was necessary to have a long narrow tank. Three tanks, each 6 ft. long, 1 ft. deep and 6 in. wide had been found quite large enough for 950 KW. at 7,500 volts, and the load could be reduced to 40 KW. at the same voltage. With small tanks the water supply must be reliable and regular, as, owing to the decrease of resistance with the rise of temperature of the water, there would be danger of a heavy overload if the supply were to fail. With tanks of small capacity the rise of temperature was very rapid. An open drain should be fitted under the weir, so that in case of a failure of the water supply, the level of water in the tank would fall, and the resistance of the water remain about constant.

MR. KEMP agreed that it was impossible to use canal water in small metal tanks for 6,000-volt tests. In the tests to which he had previously referred, he had used town's water. Under these conditions he had found it possible to vary the load from 40 to 4,000 KW. simply by varying the immersed area of the electrodes, the amount of water remaining constant. As a precaution against failure of the water supply and the consequent increase of load, he had used a drain pipe at the bottom of the tank; the amount of load on the tank was under perfect control, and could be readily adjusted by means of a small motor operated from the switchboard.

MR. R. A. CHATTOCK (Birmingham) said he had used two plates placed in a canal. The conditions were 100-KW. load at 1,000 volts single-phase alternating current; the electrodes were 15 ft. apart, and of 10 sq. ft. surface each. One could feel the effect of the electric current at least 50 ft. away, and fish were killed within a radius of 20 ft. As a danger signal whilst the test was going on, a small raft was moored between the electrodes from which two iron plates were suspended in the water 18 in. apart; a 100-volt lamp was connected to these plates, and the drop in pressure was sufficient to light this up. He had tried a single-phase test with a metal tank as one pole, and a rod in the centre of the tank as the other, and the result was practically a short circuit. Using the same tank and two rods, one for each pole, gave quite satisfactory results. He had had trouble with wooden tanks owing to deterioration of the wood allowing the water to leak, and causing charring on the outside; he had also known the wood to catch fire if this was allowed to go on.

MR. F. FORREST (Birmingham), referring to the adjustment of the electrodes by sliding the supports along the top of the tank, said that some mechanical means of adjustment was necessary such as a right and left-hand screw, or a pulley arrangement.

MR. J. D. COALES (Birmingham) called attention to the peak in the wave form of the current in a choking coil worked at high flux density, and to illustrate his remarks gave particulars of the no-load current wave form of two 7½-KW. transformers, the primaries of which were connected in parallel to 208-volt mains, instead of being supplied at their rated pressure of 116 volts. The frequency was 50 per second, and the effective current 9·3 amperes; the maximum value as shown by an oscillogram was about 18·7 amperes, and the maximum flux density about 10,600 lines per sq. cm. The duration of the peak was confined to a comparatively small portion of the cycle, with its middle point roughly coincident with the instant of zero pressure, and he suggested that when an alternator was

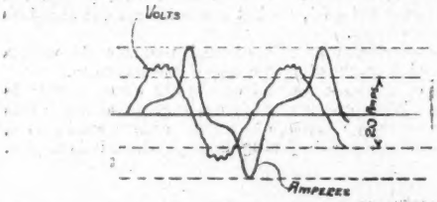


DIAGRAM B.

tested on such an inductive load, the "drop" might be exaggerated unfairly, owing to the concentration of the demagnetising reaction within a small part of the cycle where it was most effective.

DR. W. E. SUMPNER (Birmingham) said that the current wave in a transformer having a closed magnetic circuit consisted of a shoulder and a peak. At very high flux densities the peak would certainly be increased, while the shoulder would be less pronounced, and the resulting wave would essentially differ only very slightly from a sine curve. The method used by the authors was very flexible, and seemed to him to be the best solution of the problem of obtaining an alternating-current load of adjustable power factor.

MR. N. B. ROSHER (Gillingham) recommended the use of wire resistances, which could be mounted on frames in units, and were very convenient for connecting up to test-room terminals. They could easily be sent from the works for testing generators after final erection.

MR. A. E. GOTT (Birmingham) had used lead plates of 2 sq. ft. area and ¾ in. apart; with pure country water at 100 volts he only got 2 or 3 amperes, but with the addition of 2 or 3 oz. of acid, he could dissipate 60 H.P. with the plates a safer distance apart. With 20 H.P. the water was found to boil in about an hour. He advocated water-cooled wire resistances. In his opinion, insulated water tanks would not be tolerated as permanent plant under the new Home Office regulations.

PROF. GIBBERT KAPP said the tank itself should be earthed, but surrounded by a platform supported on insulators and covered with a rubber mat. He had used earthenware tanks for small loads, and found them to work very well. The actual power factor of a resistance consisting of iron plates in water, he believed, was not quite unity; the water load took a leading current, as electrolysis was continually going on and producing a film of gas on the plates, and thus forming a condenser.

MR. R. K. MORCOM, in reply, said that he had never experienced any trouble through shocks from the water. There were objections to using the hot testing water in boilers. Ordinary canal water would require to be softened before it could be used in this way, and by the time it had passed through the water softeners it would have

lost a great deal of heat. If the water were softened previously it would not be so suitable for testing, and any waste would be expensive on account of the chemicals used. He had carefully considered the question of utilising the power usually wasted in the test room; it would necessitate the spending of a large sum of money, and on the very best showing he had found that it would only be possible to make an inadequate percentage on the capital expenditure. In his experience it was only by using a moderate drop per foot of water that it was possible to avoid charring the wood of the tank. The objection to porcelain tanks was mainly that of expense. Wooden tanks had the advantage of being cheap; for instance, on the site a good temporary tank could be made out of a good packing case by simply caulking up the joints. They found it necessary to use a small amount of induction in conjunction with the water load in order to get unity power factor, but he had not attached much importance to this, as the accuracy of the readings had been questioned. He did not believe that the Factory Inspectors would take exception to the insulated tank.

Mr. D. K. Morris said it was of great importance that the inductive load should not produce a different kind of load from that occurring in practice. Considering that only 3 or 4 per cent. of the current wave was sufficient to bring the flux over the knee of the saturation curve, it would be seen that practically the whole of the current wave corresponded to the region of low permeability, where, as was well known, the variations of permeability were not great. Thus the current wave was not far from being such that its rate of change was a copy of the volt wave, and the reactions in the generator for which the test was being carried out were therefore entirely normal. A slight distortion of wave shape was, however, quite proper in such tests, for this would occur in practice when a load of bad power-factor arose.

Cost of Electrical Power for Industrial Purposes.

Mr. J. F. C. Snell's paper on this subject was further discussed by the Institution of Electrical Engineers at Glasgow on the 11th ult.

Mr. Newington (Edinburgh), who opened the discussion, said that electric motors displaced town gas every day of the week, and probably the same thing would happen with suction gas plant after it had been running a bit longer. Table I did not allow for supervision, general establishment charges, or for rating. In Edinburgh they had not found any necessity for high-tension transmission, though they had some 90,000 h.p. motors connected. High diversity factor would reduce the load factor, and so might not be an advantage. For combined lighting and power undertakings they wanted a diversity factor of 1 during the greater number of hours of the day, and as high as possible during the one or two hours of peak load. It was never during these hours that it would be of any use to them. Mr. Snell seemed to think that London was urgently and constantly in need of 400,000 h.p. of machinery electrically-driven, and that unless it got that its trade would vanish. He would ask him not to be too hurried. At the end of 42 years London could make a clean sweep and start afresh.

Mr. Raphael (London) said one of the great reasons why the purchase clause of 1882 was altered, was that it was seen almost directly that electrical engineers could not supply plant and make a profit on their outlay and then have their plant sold at what was practically scrap value. In ordinary manufacturing businesses frequently one turned over one's capital several times in a year, but in electric supply business one did not turn over one's capital in the year. The case was now much worse, because if one was to supply in the most efficient manner, he must not only scrap the old plant, but must put in very much larger plant, and they had not got 42 years to run. In some cases power was certainly being supplied at too cheap a rate, and the question of diversity factor and load factor was not sufficiently construed, but it was no use trying to sell at a high price at first, because then supply would be at a price at which it would not pay people to buy. He (the speaker) thought from that point of view the present-day undertakers were perfectly right, and in many cases, as Mr. Snell's paper showed, it would pay them to put in larger plant, and to re-model their stations at once, if it were not for this terrible purchase clause.

Mr. Stothert said that, at his own works, the works costs were ·25d. to ·23d.; with interest and depreciation, the total cost was ·46d. to ·45d. per unit. Their load factor was about 60 per cent. At the paper mill of Messrs. Watson & Co., Linwood, the load factor was about 70 per cent., and the works cost, including 7 per cent. interest on capital, worked out at ·19d.

Mr. Newington gave some figures of two suction gas engines, each of 90 h.p., driving dynamos to supply power for engineering works. One engine ran about ten hours a day and the other four to five hours a day. The works were previously supplied by the Corporation, and the combined cost per unit was 1·2d. The following were the costs for the 12 months ending December 31st, 1907:—

Wages	£100
Coal	133
Water	31
Oil, waste, &c.	31
Repairs	8
Insurance	24
Total running cost	£327

The capital cost for the two gas engines, dynamos, &c., was £3,680. 10 per cent. on that for depreciation, interest and so on, was £368, giving a total cost of £695. That worked out at 1·1d. per unit. The value of the land of the engine house was not taken into account. He thought that 10 per cent. for depreciation and interest was on the low side, because, in a manufacturing concern of that sort at least 5 per cent. or more should be allowed for interest if the money had been put into the concern. The maintenance was extremely low, because the plant was quite new. These figures showed that a private suction gas plant was not any cheaper than the town supply.

Mr. Parsons remarked that Mr. Snell said that it would be better if the Local Government Board and the Board of Trade had prevented some of the smaller local stations from putting up their own plant, but the places that had taken a bulk supply, so far had not come out particularly well.

The Chairman (Prof. Baily) commented on the recommendation which Mr. Snell gave that practically the whole of the power load should be supplied from entirely new stations, with no obsolete plant, and with no debts, and that all the people who had incurred the debts were to be left out of account. If they were to be compensated, the capital charge would be as big as if they left these people to supply themselves. But Mr. Snell's meaning was that they were not going to buy those people out, and one could not characterise that except as something akin to robbery. He questioned whether the power charges which had been stigmatised as unbusinesslike were really unbusinesslike if they looked at it from one point of view. The stations in London were started originally as lighting stations 20 years ago. They started supplying power, and put new plant down for the purpose. They were perfectly justified in charging for their power what it actually cost them, taking into account that it was supplied from brand new plant, and they were not bound to debit that new branch of their business with the heavy capital that they had incurred from the old branch of their business. Mr. Snell's objection that a large increase in the power began to bring these people into bankruptcy was obviously not the case, because they charged what it cost them to produce with their new plant. They would be only too delighted to put down more new plant and be able to supply more cheaply and entirely free from the heavy charges of that pioneer undertaking. All the best places had been picked out by the pioneers, and in order to get any business for large power stations they must turn out these pioneers; they must practically confiscate the good-will they had built up and must confiscate all the experience which they had gained and had paid for. If they paid honourably and completely for all the expenses which the pioneers had been put to, he could not see how they were going to manage these very low charges. If they did not do either of these, then they were condemned to work on very new ground and they would have all the pioneer work; they would have to build big stations and wait for years until those stations were loaded up, and, except that they had got better plant, they would be just in the same position as the old pioneers.

Mr. Snell (in reply) said he must confess that he was getting rather tired of the paper. Secs. 1 and 2, as explained on page 4, did not include general establishment charges or rating, and spare plant was not included in Tables I and II. In Table II the cost of oil was 42s. 6d. per ton; but oil was now 82s. 6d. per ton, and that had made an enormous difference to the columns in Tables I and II. He explained the data in other tables, and said that electrical suppliers could hold their own in most cases against individual and local plant. In many tests that he had made, he had not yet found a gas engine which took as little as 22 cb. ft. per h.p. There was no doubt that the London companies in many cases were selling at less than the cost to them. It was not intended that they should be robbed, but to build a large power station at comparatively small cost, and to supply power to the London companies at such a rate that with their capital costs now incurred added, they would be able to make a reduction in the cost of production to meet the demand for cheaper power and lighting.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

4,657. "Improvements in the manufacture of electrical resistances." C. Ruzicka. March 2nd. (Complete.)

4,666. "Improved electric current leakage indicator." J. P. Winn. March 2nd.

4,668. "Improvements in arc lamps." A. Holman. March 2nd.

4,683. "Improvements in electrical terminal connections." S. R. Ridgway, F. J. Ridgway and C. M. Brunt. March 2nd.

4,689. "Improvements in electrical clock systems." A. R. Upward. March 2nd.

4,692. "Improvements in brush-holders for electrical machines." Siemens Schuckertwerke G.m.b.H. (Date applied for under Sec. 91 of the Act, March 2nd, 1907, being date of application in Germany.) March 2nd. Complete.)

4,696. "Improved electric locking and inter-locking indicating push-button switch primarily designed for use in connection with push-button operated electric lifts." A. H. Curtis, A. H. Mackley and Adams Manufacturing Co., Ltd. March 2nd.

4,739. "Improvements in the construction of the supports or grids for the electrodes of secondary batteries." H. Garde. March 2nd.

4,744. "Improvements relating to the electrolytic deposition of metal on hollow articles." E. Friedheim. (Application for Patent of Addition to No. 7,563/07. Date applied for under Sec. 91 of the Act, March 4th, 1907, being date of application in France.) March 2nd. (Complete.)

4,757. "Improvements in or relating to electric bells." E. A. Graham. March 2nd. (Complete.)

4,760. "Improvements in and relating to the manufacture of a conducting connection for use in electric incandescent lamps." H. W. Lake. (Elektrische Gluhlampenfabrik Watt, Scharf, Loti & Latzko, Austria.) March 3rd. (Complete.)

4,762. "Improvements in electrodes for arc lamps." Allgemeine Elektricitats Gesellschaft. (Date applied for under Sec. 91 of the Act, March 1st, 1907, being date of application in Germany.) March 2nd. (Complete.)

4,774. "Improved key switch lamp-holder for electric light." G. H. Ide. March 3rd.

4,799. "Improvements in and relating to controllers for electric motors." Crompton & Co., Ltd., and C. Crompton. March 3rd.

4,801. "Improvements relating to ignition devices." Peter Brotherhood, Ltd., and C. W. Bryant. March 3rd.

4,819. "Fixings for electric fittings." J. J. Rawlings. March 3rd.

4,843. "Improvements in apparatus for receiving undamped electric oscillations." O. Scheller. (Date applied for under Sec. 91 of the Act, March 4th, 1907, being date of application in Germany.) March 3rd. (Complete.)

4,844. "Improved apparatus for plotting resonance curves for determining the damping and frequency of electric oscillations." O. Scheller. (Date applied for under Sec. 91 of the Act, March 4th, 1907, being date of application in Germany). March 3rd. (Complete.)

4,852. "Improvements in alternating current commutator dynamo-electric machines." W. Doinikoff. March 3rd. (Complete.)

4,867. "Improvements in automatic electric winding devices for clocks and the like." The Firm of One Year Electric Clock Co., Grundke & Lazarus. (Date applied for under Sec. 91 of the Act, March 4th, 1907, being date of application in Germany.) March 3rd. (Complete.)

4,883. "Improvements in liquid magnetic compasses." C. Batty and W. Batty. March 4th.

4,884. "Improved electrical block signalling system for railways." G. H. Brown. (Application for Patent of Addition to No. 10,687/07.) March 4th.

4,875. "Improvements in and connected with the electro-deposition of metals." F. I. Gibbs. March 4th.

4,909. "Improvements in electrical switches for use in flash signalling." G. H. Butterworth and E. Veevers. March 4th.

4,922. "Improvements in connection with electric lamps and their circuits." C. H. Stearn and C. F. Topham. March 4th.

4,932. "Device for automatically firing guns on ships by means of electricity." H. Treude. March 4th.

4,940. "Process for producing positive storage battery plates." J. R. d'Varad and A. Meislinger-Meszlenyi. March 4th. (Complete.)

4,948. "Improvements in alternating current translating devices." L. F. Howard. (Date applied for under Sec. 91 of the Act, April 25th, 1907, being date of application in the United States.) March 4th. (Complete.)

4,950. "Means of regulating dynamo-electric generators and motors." C. H. Prott. March 4th. (Complete.)

4,956. "Improvements in the manufacture of incandescent bodies for electric lamps." F. J. Planchon. March 4th. (Complete.)

4,957. "Improvements in connection with enclosed arc lamps." W. J. Davy. March 4th.

4,962. "Improvements in and relating to electric controllers or switches." C. W. Atkinson and E. Garside. March 4th.

4,964. "Improvements relating to electrically-controlled railway points and signals." Siemens Bros. & Co., Ltd., and L. de M. G. Ferreira. March 4th. (Complete.)

4,977. "Improvements in electric arc lamps." A. D. Jones. March 5th.

4,987. "New or improved appliances or devices for indicating and recording electric currents." A. Barry and F. Ferrand. March 5th.

4,995. "Improvements in electric resistances." W. F. Jones. March 5th.

5,004. "Improvements in electric winding-engines." H. J. S. Heather. March 5th.

5,015. "Improved process of bonding rails." G. Harrison. (Electric Railway Improvement Co., United States.) March 5th. (Complete.)

5,016. "Improvements in apparatus for bonding rails." G. Harrison. (Electric Railway Improvement Co., United States.) March 5th. (Complete.)

5,017. "Improvements in electrodes for electric welding, soldering or brazing." G. Harrison. (Electric Railway Improvement Co., United States.) March 5th. (Complete.)

5,025. "Improved means for covering or protecting underground electric cables." L. Moser. March 5th.

5,026. "Improved disinfecting device for attaching to mouthpieces of telephones, speaking tubes and the like." A. Tomlins and E. M. Hill. March 5th.

5,029. "Improvements relating to electric arc lamps." Johnson & Phillips, Ltd., and S. Paterson. March 5th.

5,040. "Improvements in metallic filaments or rods for electric incandescent lamps." F. J. Planchon. (Date applied for under Sec. 91 of the Act, November 9th, 1907, being date of application in France.) March 5th. (Complete.)

5,042. "Improvements in printing and sight-reading telegraph apparatus." E. W. Beech. March 5th.

5,054. "Improvements in electric clocks." J. Neale and E. Powell. March 5th. (Complete.)

5,064. "Improvements connected with electric batteries." T. L. Rowlands. March 6th.

5,068. "Improved suspension for compass bowls." W. D. White. March 6th. (Complete.)

5,078. "Improvements in electric lamps for motor-cycles and the like." J. W. Greenwood. March 6th.

5,080. "Improvements in telephone instruments." W. Aitken. March 6th. (Complete.)

5,086. "Improved device for operating push buttons from a distance." J. Habriman. March 6th.

5,089. "Improvements in or relating to electric tremblers." L. Savart and J. Graindorge. (Date applied for under Sec. 91 of the Act, October 31st, 1907, being date of application in France.) March 6th. (Complete.)

5,097. "Improvements relating to portable electric accumulators." L. Bristol. March 6th.

5,099. "Improvements relating to electric switches." A. P. Lundberg, G. C. Lundberg and P. A. Lundberg. March 6th. (Complete.)

5,137. "Improvements in and relating to telegraph, telephone circuits and the like." H. H. Harrison and The British Insulated and Helsby Cables, Ltd. March 6th.

5,158. "Improvements in low-tension electric ignition apparatus for internal combustion engines." Albion Motor-Car Co., Ltd., and T. B. Murray. March 7th. (Complete.)

5,159. "Improvements relating to electro-mechanical systems for automobiles and the like." H. Pieper. March 7th. (Complete.)

5,160. "Improvements in or relating to electro-mechanical transmission systems for automobiles and the like." H. Pieper. March 7th. (Complete.)

5,170. "Improvements in or connected with electric auto-musical instruments." T. E. R. Phillips. March 7th.

5,172. "Improvements in or connected with ships 'tell-tale' telegraphic apparatus." Chadburn's (Ship) Telegraph Co., Ltd., and A. J. Grant. March 7th.

5,176. "Electric cash clock register." E. Ingle. March 7th.

5,198. "Improved process and apparatus for plating." K. Miele. March 7th.

5,199. "Improvements in electric cables." H. Gray. March 7th.

5,212. "Improvements in electrodes." E. W. Jungner. March 7th. (Complete.)

5,214. "Improved process for depolarising galvanic batteries." E. W. Jungner. March 7th. (Complete.)

5,223. "Improvements relating to galvanic apparatus." E. W. Jungner. March 7th. (Complete.)

5,225. "Improvements in electrodes for arc lamps." Allgemeine Electricitats Ges. (Date applied for under Sec. 91 of the Act, July 5th, 1907, being date of application in Germany.) March 7th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool; price, post free, 9d. (in stamps).

1907.

Electrolytic Apparatus. A. J. Boult. (Elektricitäts Akt.-Ges. vorm. Schuckert and Co.) 3,000A. February 6th. (Date applied for under Rule 13, February 6th, 1907.)

Device for Simultaneously Bolting Doors and Switching On Electric Lights. A. E. Wynn. 3,029. February 7th.

Electric Arc Lamps. A. D. Jones. 3,060. February 7th.

Mechanism for Automatically Regulating the Point of Ignition of the Charge in Explosion Motors. Daimler Motoren Ges. 3,514. February 12th. (Date applied for under International Convention, February 13th, 1906.)

Electric Safety Fuse or Cut-Outs. A. Hepke and K. Diener. 3,698. February 14th.

Variable-Speed Electric Motors or Variable Voltage Generators. L. Torda. 3,881. February 16th.

Magneto-Electric Ignition Devices for Internal-Combustion Engines. O. Bames. 5,537. March 7th.

Tumbler Switch. E. C. Lea. 6,455. March 18th.

Magnetic Clutches or Brakes. H. W. Ravenshaw, V. G. Middleton and W. E. Townsend. 6,751. March 20th.

Electric Controllers or Switches. C. W. Atkinson. 6,925. March 22nd.

Electricity Meters. W. B. Thorpe. 7,449. March 28th.

Mounting Incandescent Electric Lamp Filaments. British Thomson-Houston Co. (General Electric Co., United States.) 8,642. April 13th.

Interrupters for Electric Circuits. C. Schmidt. 8,706. April 15th.

Automatic Electric Switches. H. C. L. Holden and G. K. B. Elphinstone 9,294. April 22nd.

Electric Pendant Lamps for Indoor Lighting and for other Services. T. Elliott. 9,845. April 22nd.

Electrically-Operated Winding Gear. Allgemeine Elektricitäts Ges. 11,071. May 11th. (Date applied for under International Convention, May 12th, 1906.)

Method of and Means for Altering the Working Speed of Polyphase Motors. Siemens Bros. Dynamo Works, Ltd., and H. B. Poynder. 11,873. May 22nd.

Lightning Arresters and like Protective Devices for Electric Conductor Systems. British Thomson-Houston Co. (General Electric Co., United States.) 14,100. June 18th.

Electric Switches. A. P. Lundberg, G. C. Lundberg and P. A. Lundberg 16,574. July 19th.

Interrupters for Electric Circuits. R. H. Wappler and C. F. Fayer. 17,306. July 29th.

Electric Switches. Siemens Schuckertwerke Ges. 17,410. July 30th. (Date applied for under International Convention, September 24th, 1906.)

Starting Devices for Internal-Combustion Motors. G. S. Omegna. 17,602 August 1st. (Date applied for under International Convention August 2nd, 1906.)

Electroplating. S. O. Cowper-Coles. 17,717. August 2nd.

Detectors for Wireless Telegraphy. Ges. für Drahtlose Telegraphie 19,794. September 4th. (Date applied for under International Convention September 8th, 1906.)

Means for Connecting Alternating-Current Generators to their Prime Movers. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Akt.-Ges. 19,856. September 5th.

Starting Devices for Vapour Lamps. Aktiebolaget Aladdin. 20,185. September 10th. (Date applied for under International Convention, September 10th, 1906.)

Electrically-Operated Switching and other Devices. F. Conrad. 20,676. September 17th. (Date applied for under International Convention, September 20th, 1906.)

Method of Electric Motor Control and Apparatus Therefor. W. C. Yates and W. O. Lum. 21,045. September 21st. (Date applied for under International Convention, September 22nd, 1906.)

Electric Indicators. C. von Peez. 21,119. September 23rd.

Manufacture of Incandescence Filaments for Electric Incandescence Lamps and Apparatus Therefor. Siemens & Halske Akt.-Ges. 22,746. October 15th. (Date applied for under International Convention, October 16th, 1906.)

Electric Arc Lamps. Johnson & Phillips, Ltd., and C. F. Tubbs. 24,706. November 7th.

Integrating Train for Double Tariff Electric Energy Meters. V. Arcioni. 24,862. November 9th.

Testing Apparatus for Magneto-Electric Spark Ignition Apparatus. G. A. Unterberg and F. Helmle. 27,933. December 18th. (Date applied for under International Convention, October 17th, 1907.)

Electric Switches. T. Clark and I. Vlasto. 555. January 8th.

Electric Distribution Systems. British Thomson-Houston Co. and E. B. Wedmore. 634. January 9th.

Electric Switches. British Thomson-Houston Co. and E. B. Wedmore. 634A. January 9th. (Date applied for under Rule 13, January 9th, 1907.)

Indicating and Recording Apparatus for Electric Pyrometers. W. Armour. 2,923. February 6th.

Electric Cut-Outs. V. Hope. 3,025. February 7th.

Method and Apparatus for Treating Textile Fibres or Materials by Electrolysis in Cleaning, Extracting, Carbonising, Stripping, Sterilising and Disinfecting Same. F. Spivey. 3,184. February 8th.

Electrical Heating Apparatus. A. B. Holmes. 3,226. February 9th.

Electrical Brakes for Hoisting Apparatus, Cranes and the Like. W. Reuter. 3,305. February 9th.